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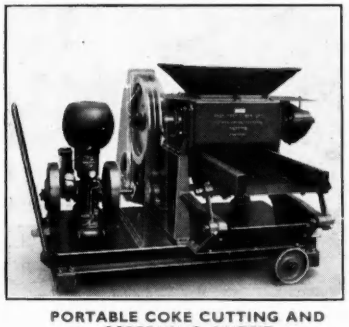
Gas Journal

LIGHT - HEAT - POWER - BY-PRODUCTS

Vol. 231. 92nd Year. LONDON, JULY 3, 1940. Registered as a Newspaper No. 4024. Price 1/-

JUL 23 1940

Coke Handling Plant by Corts of Reading



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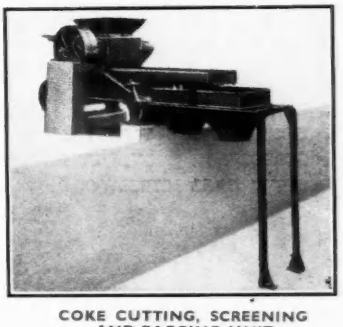
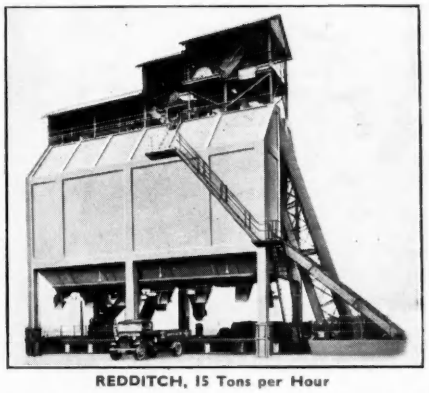


COKE CUTTING, SCREENING AND BAGGING UNIT



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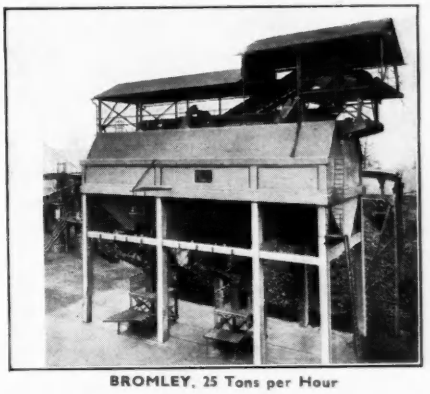
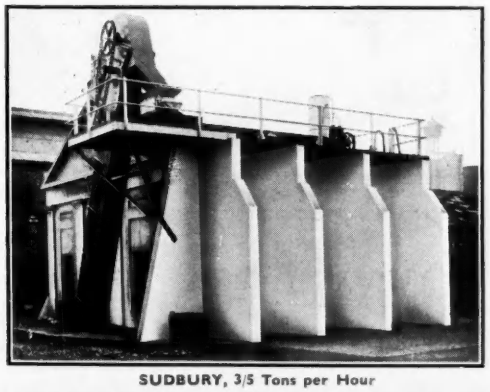


BROMLEY, 25 Tons per Hour



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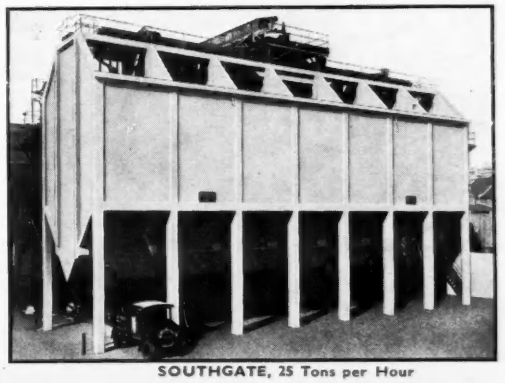

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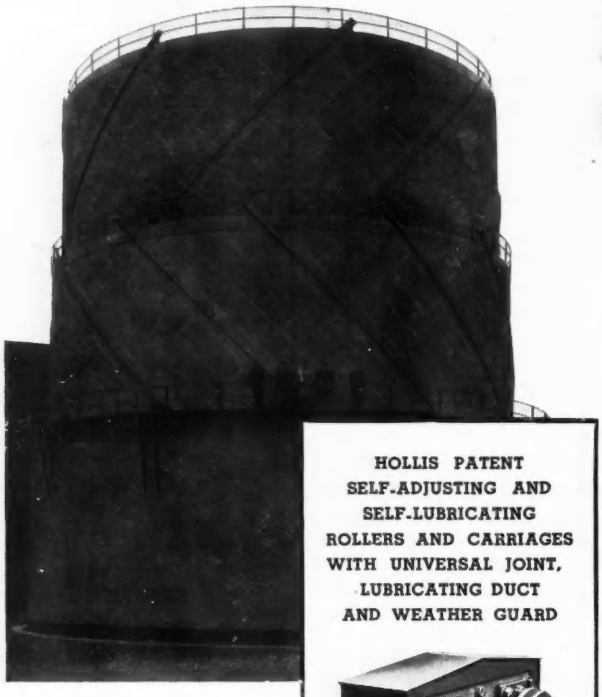

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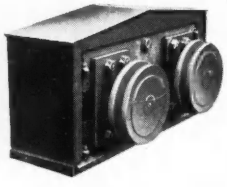

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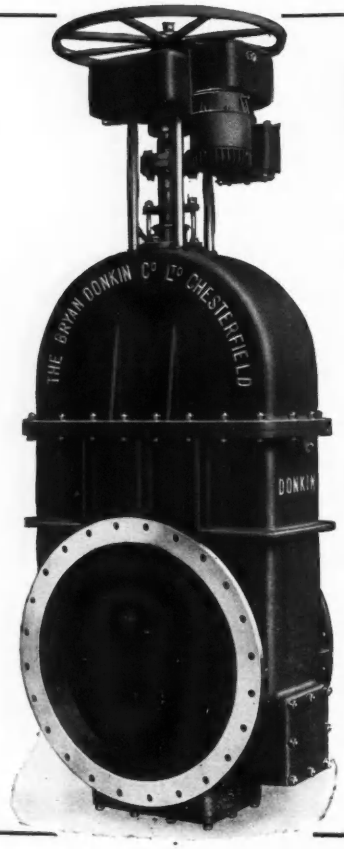

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Advertisement Index, see p. 42.

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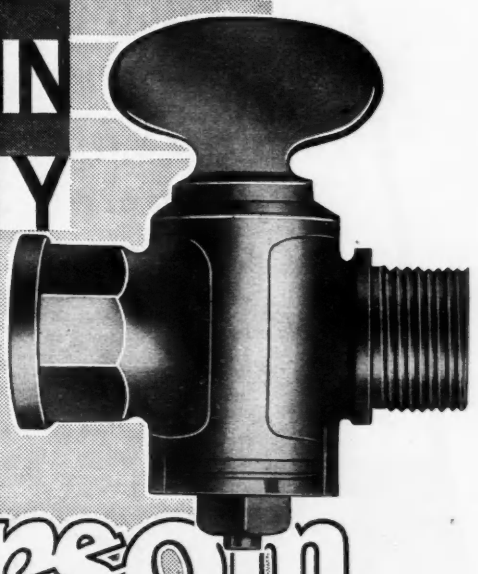

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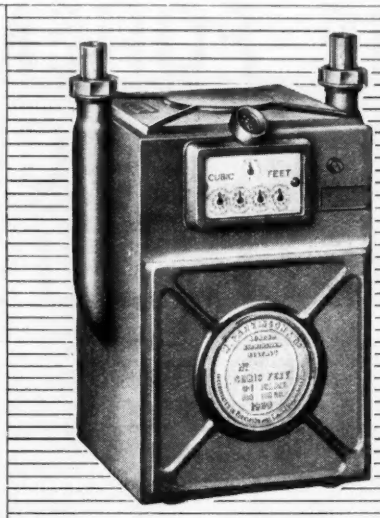

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GAS JOURNAL, JULY 3, 1940

VOL. 231 92nd YEAR No. 4024

EDITORIAL NOTES

THEN AND NOW

In his Presidential Address to the Waverley Association, Mr. A. S. Nisbet invited consideration of the changes wrought in the last forty or fifty years in practice and outlook in our Industry. He said "unhesitatingly" that a gas manager was better off than he is to-day. It is obvious that Mr. Nisbet was not thinking in terms of £ s. d. in expressing this opinion, his view being that in those days a gas manager was "pretty much his own master." He had a straightforward job to do—to make and sell gas. The job may have been straightforward, but we suggest that the dominant attitude of the gas manager of those days was concerned with making gas, and not with selling it, and that his outlook was narrower than it is to-day. Of course, the gas manager of fifty years ago was a fine fellow, and on one point at least he scored over many gas engineers and managers of to-day—he was capable of "speaking his mind." Discussions at meetings of gas engineers and other executives fifty years back *were* discussions. Times have altered. Now many discussions are stereotyped, and apt to be academic, circle-like, and "abstruse." We may be cleverer; to what extent cleverness can cloak woolly thinking we are not prepared to discuss. Many a recent discussion at a gas meeting has had about it a sense of unreality. Many discussions have been "engineered" and artificial. Clever, yes, but lacking in direction; much time has been spent in scientific highbrow debate.

We think that during the past fifty years the Gas Industry has progressed a great deal—almost in spite of itself. We think that in many ways it does not yet appreciate that it is a great chemical industry and not merely a purveyor of gas and coke. We think that the gas manager of to-day is in many respects better off than he was fifty years ago, and we cannot agree with Mr. Nisbet, who remarked in his Address that the gas manager of the time, like the redoubtable Captain Kettle, held the view that "if he was going to be a King then, by James, he'd carry a full King's ticket." He may have held the view, but what actually happened fifty years ago? At the time the "Journal" was full of complaints from gas managers to the effect that their lives were not in accordance with anything like the notion of Captain Kettle. In many parts of the country the advice of the gas manager was not heeded. If he asked his board of directors or his committee for money for extensions of plant or increased storage facilities he was not regarded kindly. He was not a Captain Kettle. We read that he lived in dread of the winter, which inevitably brought a string of complaints from consumers of all types, domestic and industrial. Expansion of business was checked and hindered. Fifty years ago a gas manager's advice could not prevent strikes and riots. In more than one instance a gas manager combined with his work the duties of sanitary inspector (without "even a clerk to copy a letter or a boy to take it to the post when written and copied"—"Journal," Aug. 26, 1890). Which does not savour of Captain Kettle. Fifty years ago there was little co-operation in the Gas Industry. The Gas Light and Coke Company and the South Metropolitan Gas Company were at loggerheads; "professional" gas engineers were on their hind legs against the mere manufacturer of plant and appliances—the "trader." Everywhere there was cleavage of opinion; it would seem that there was no desire for co-operation. The average gas manager may have been able to develop the power of initiative and individuality, but to what extent this sold gas we do not know.

Not, of course, that there was inactivity in the Gas Industry, or lack of criticism outside it fifty years ago. The Balloon Society of Great Britain, for example, was highly critical. This energetic body argued vigorously that the London gas companies were all wrong, that the L.C.C. should take them over and deliver cheap gas for balloons. The position of the companies was stated to be "disastrous." What was needed was "automatic gas," produced from oil. In point of fact, a concern called the Automatic Gas Company was formed, and at one of the meetings of the Balloon Society a diagram was exhibited which portrayed a retort house worked under the "existing system" with eleven men in semi-nude condition charging the retorts with scoops. Alongside the diagram was another depicting "automatic gas" plant, operated by a "gentlemanly-looking fellow, stylishly dressed, and with a stick in his hand" ("Journal," Sept. 9, 1890). At the time, too, there was formed an organization known as "The People's Non-Explosive & Sanitary Gas Company," intended to manufacture and supply gas, the discovery of General Eugène de Beauharnais, which was not only inexplosible and excessively cheap, but was also possessed of medicinal qualities. It could be inhaled "with great benefit." Nor was there lack of inventive thought on the part of appliance makers. A Leeds manufacturer brought out a combined gas washing machine and cooker for roasting and grilling. This trinity machine was novel; unfortunately the public did not take kindly to washing linen and cooking food with the same appliance. Some gas managers may have been, and probably were, their own masters in those days—masters on the works. They were certainly not masters on the district. There was no liaison with the architect or builder. Houses were carcassed with pipes totally inadequate to supply the number of lighting burners needed for proper illumination.

We suggest that the gas manager of to-day is better off to the extent that he is in a position to afford the consumer a far higher standard of gas service. He has at his disposal far better facilities—better gas making and purifying plant, better appliances of a wider range, development and research organizations, trained technicians, co-operative selling schemes—so one could go on. His task is more complex, but his work is surely more interesting and his sphere of influence greater; and we think we are right in saying that his professional status is higher to-day than it was fifty years ago.

CO-OPERATIVE RESEARCH

For several years now the American Gas Association, through its Committee on Domestic Gas Research, has carried out a programme of basic research on domestic gas appliances. The object has been to make available technical data which could be employed by appliance manufacturers and gas engineers in improving efficiencies and other performance characteristics of such equipment. This has constituted one particular phase of a broad programme of research into problems of production, distribution, and utilization of gas designed to render more efficient gas service to domestic, commercial, and industrial consumers. Already four bulletins summarizing the work have been prepared. Two cover gas cookers, a third deals with the design of atmospheric gas burners, while the fourth, which has just been issued, is concerned with domestic gas water heating. We are indebted to the Association for a copy of this bulletin on water heating, and an abstract of the findings recorded in it will be found in this issue of the "Journal." We have had occasion previously to congratulate the Association on the results of this type of co-operative research, and we have no hesitation in commending the work described in the present bulletin, which represents the culmination of investigations extending over a period of nearly three

years. The data it contains should be of material assistance to all interested in gas water heating, beneficial to manufacturers in appliance development work in the United States, and of help to gas undertakings in affording guides to certain installation problems.

It is made clear in the bulletin that when the programme of research was inaugurated it was well appreciated by those responsible that all aspects of gas water heating had benefited by the research and development of appliance manufacturers and of individual gas undertakings. It was not intended in the very least that the investigations should be a substitute for these separate and independent activities. Actually, far from discouraging these independent activities, the scope and intensity of such work have increased during the period covered by the A.G.A. investigations. We are not at all surprised that this has been the case; and it constitutes a strong argument in favour of co-operative industry research. It does give rise to a better understanding of the desirability and value of research. The work has produced technical data capable of wide application and has served to eliminate unnecessary duplication of the same work in a number of independent laboratories. To this extent it has freed the facilities and resources of separate undertakings for concentration on product development and other specific applications of the data.

The work was carried out at the A.G.A. Laboratories under the supervision of the Association's Committee on Domestic Gas Research jointly with a manufacturers' technical advisory committee of the Association of Gas Appliance and Equipment Manufacturers. The results may be put into two categories—data applying to the design of the appliance and those covering selection of heaters of correct size and their proper installation for adequate hot water service at the best practical efficiency. In the first classification results show means of obtaining higher service efficiencies by designing flue and combustion losses to minimize flue losses, and by insulation. The data should be useful in promoting improved combustion performance. An interesting analysis is made of how thermal efficiency and stand-by loss characteristics of a storage heater combine with its input rate and storage capacity to give the best results, and a method of selection of the size of heater to install in given circumstances is set out. This latter consideration is, of course, of the utmost importance, and the application of the suggestions should result in a more economical hot water service. This investigation of the A.G.A. has obviously been carried out thoroughly and with the exercise of imagination.

Iron and Steel Control

Two new Iron and Steel Control Orders came into operation on July 1. One is the control of Iron and Steel (No. 9) (Scrap) Order, which revokes all existing acquisition licences under the No. 7 Order in so far as they apply to scrap iron ingot moulds and scrap iron ingot mould bottom plates, in order to ensure that the best possible use shall be made of these materials. The Order provides that no person shall treat, use, or consume them unless he holds a licence authorizing him to do so or is authorized by a special or general direction issued by the Ministry of Supply. In addition to consumers having to obtain licences to acquire and treat, use, or consume scrap iron ingot moulds and bottom plates it is now necessary for merchants to obtain licences not only to acquire but also to treat the material, including breaking or cutting up the moulds into furnace or cupola sizes. Existing maximum prices for hematite ingot mould scrap are cancelled and new maximum prices are fixed, applicable in all districts, ranging from £5 12s. 6d. to £6 2s. 6d. per ton according to size.

The other new Order which came into force on July 1 is the Control of Iron and Steel (No. 10) Order, which varies the No. 8 Order introduced on April 4. The new Order substitutes a fresh schedule of maximum prices for iron and steel products. The new prices represent additions of from 3s. 6d. to 9s. per ton for pig iron, 22s. 6d. to 27s. 6d. for billets, with corresponding adjustments for other products. These advances are in the main to meet from a central fund further abnormal costs of imported materials under present conditions. They also include some allowance for the rises which have taken place in manufacturing costs since the outbreak of war, including recent increases in scrap prices and railway rates.

Women in the Gas Industry

The subject of employing female labour in the Gas Industry was, it will be recalled, reopened in these columns on May 29—the object being to study the extent to which women could be engaged to take over some of the heavier works duties of men serving with the Forces. The practicability of employing women in other branches of the Industry—particularly on the maintenance side—has often come under consideration. But while a few undertakings, notably Neath, have adopted a definite policy in this direction, the Industry as a whole still seems reluctant to take the initiative in a matter which may before long be forced upon them. For which reason it is of interest to learn of the steps lately taken by a number of undertakings in the Gas Consolidation group. According to details sent us by Mr. W. J. Tipping, the District Organizer, ten employees were required for appliance maintenance, sales, and meter reading duties. Women whose ages ranged from 20 to middle age and whose previous employment varied from office and cinema to warehouse and factory were appointed and given three weeks' intensive training. This consisted of creating keenness and loyalty, a brief sales course, including demonstrating, elementary technical knowledge, and practical maintenance. Mr. Tipping reached the conclusion that the women compared very favourably with men to whom he had in the past given similar courses. He observes that the women are enthusiastic, excellent time-keepers, learn quickly, and carry out the practical work in a most satisfactory manner. They are especially suited, he says, to lighting maintenance, and the first day they were put to work on the district they secured a number of orders for new appliances. It would be interesting to know the experience of any other undertakings which have recently taken steps in this direction.

"Gas Journal" Directory

In order that readers may be able to keep the particulars contained in the "JOURNAL" Directory up to date, we summarize in the following list various changes of which we have been advised during the past month:

Page 30. GREAT YARMOUTH. J. H. Greenacre appointed E. & M.
„ 46. MID-KENT. W. A. Barnett appointed E. & M. vice J. H. Greenacre resigned.
„ 66. STOCKPORT. A. H. Slade appointed S.
„ 138. BOLTON. H. Hamer, Public Lighting Superintendent, resigned.

Forthcoming Engagements

July
8.—L.C.C.A.—Finance Committee, 10.45 a.m.; Executive Committee, 11.15 a.m.; Central Committee, 2.15 p.m.
9.—N.G.C.—Meeting of Central Executive Board, Gas Industry House, 2.30 p.m.
13.—Western Juniors.—Summer Meeting at Minehead.
August.
13.—Irish Association.—Annual General Meeting at Dublin.
24.—Scottish Western Juniors.—Paper by J. Fulton on "Ammonia Recovery."

University of Leeds

The Livesey Professor, Dr. D. T. A. Townend, sends us the following June Examination Results in the Fuel Department of Leeds University:

Ph.D., Fuel and Metallurgy—G. Parker, B.Sc.
M.Sc., Gas Engineering—A. R. Hall, B.Sc.
M.Sc., Fuel and Metallurgy—K. C. Choudhuri.
B.Sc., Gas Engineering—Honours. 2nd class. D. G. R. Davies, B.Sc. (Corbet Woodall Scholar).
B.Sc., Fuel and Metallurgy—2nd class, E. Ineson, B.Sc.
B.Sc., Final Gas Engineering—R. D. Barrow, R. Bolton, M. Hamshaw, R. H. Nurse, M. Plummer.
Diplomas, Fuel and Metallurgy—S. Binner, G. D. McAdam, B. C. Marinkov, R. G. Wilkinson.
B.Sc., Subsidiary subjects—Chemistry: A. Hartley, D. Hebden, R. Long, S. E. Mayer. Engineering: W. H. Hollis, R. Long.
B.Sc., Introductory subjects—Mathematics: A. Hartley (Mathematics and Engineering), D. Hebden (Mathematics), J. Oates, William Cartwright Holmes Scholar (Mathematics, Physics, Chemistry, and Engineering), S. E. Mayer (Engineering).

R. Bolton is the son of W. Bolton, Manager of the Raunds Gas Light and Coke Company, Ltd.
M. Hamshaw was formerly technical assistant in the Brighouse Corporation Gas Department.
D. Hebden is the son of G. A. Hebden, General Manager of the South Yorkshire Chemical Works, Ltd., Rotherham.
R. Long is a pupil of Mr. H. Burton, Engineer and Manager of the Shipley Urban District Council Gas Department.
W. H. Hollis is the son of H. H. Hollis, Managing Director of the Oxley Engineering Co., Ltd.

Personal

At a meeting of the Cornish Gas Association at Murdoch House, Redruth, a presentation of field glasses was made to Mr. F. G. KINGWELL, Manager and Secretary to the Falmouth Gas Company, in recognition of the completion of 19 years' service as Hon. Secretary of the Association. Mr. Kingwell is now President of the Association. The presentation was made by the immediate Past-President, Mr. F. R. G. Grant, Engineer and Manager of the St. Ives Gas Department.

* * *

Mr. F. G. PYPER, of the Gas Light and Coke Company, has been appointed Assistant Chief Engineer to the Sheffield and District Gas Company.

Mr. Pyper, who is an Assistant at the Beckton Works, was educated at Haileybury College and Jesus College, Cambridge, and holds an Honours Degree in Engineering. He is also in possession of a First Class Certificate of The Institution of Gas Engineers in Gas Engineering, and for several years has been lecturer on Gas Engineering and Manufacture at the East Ham Technical College. Mr. Pyper is a Member of the Institute of Fuel and of the Southern Association of Gas Engineers and Managers. He commences duty at Sheffield on August 1.

Obituary

Mr. DONALD A. WOODCOCK, younger son of Mr. T. H. Woodcock, Engineer and Manager of the Stroud Gas Light and Coke Company, has been killed in action. He was a pupil of Mr. C. R. Ingham, Engineer and Manager of the Cannock Gas Company, and was educated at Wycliffe College, and later attended the School of Technicology. He enlisted last summer in the Royal Engineers (Territorial), being called up at the outbreak of war and went overseas in December last. He was 20 years of age.

NEWS OF THE WEEK

As a Result of the campaign to save wood and paper, the Gainsborough Urban District Council Gas Department have sold over a hundred gas pokers in less than a month. The campaign has been supported by advertisements each week in the local Press and has also been linked up with a drive to save matches by the adoption of gas cooker lighters.

Wartime Gas Cookery Lectures and demonstrations were held by the Perth Corporation Gas Department from June 17 to 21. They were arranged in conjunction with R. & A. Main, Ltd., who also exhibited a variety of gas appliances. The demonstrator was Miss M. K. Gompertz, who is attached to the firm. The demonstrations were officially opened by Lady Norie-Miller of Cleeve, those present including ex-Bailie Alexander Gowans, Convener of Perth Corporation Gas Committee, and Mr. A. C. Rea, Gas Engineer and Manager.

Notice is Given that the Dudley, Brierley Hill, and District Gas Company intend to apply to the Board of Trade under Section 1 of the Gas Undertakings Act, 1929, for an Order authorizing the Company (a) to raise at any time during the period of three years after the date on which the Order comes into operation additional share capital to the amount of £37,500, and (b) to borrow on mortgage of the undertaking or by the creation and issue of debenture stock an amount not exceeding 75% of the additional share capital so authorized and paid up and of any premiums paid in respect thereof.

Female Labour for Maintenance

An Interesting Experiment

At the outbreak of war the Gas Industry, after years of debate, had agreed on the need for systematic maintenance of consumers' appliances. The latter will have to be made to last longer, but male staffs are shrinking rapidly. As many gas undertakings are reluctant to engage female labour to fill the gaps, the following particulars of a recent experiment in this direction by undertakings in the Gas Consolidation group will be of interest.

Ten employees were required for appliance maintenance, sales, and meter reading duties in the Ashton-under-Lyne, Mossley, and Saddleworth districts. These positions were filled by the appointment of ten Lancashire women whose ages ranged from twenty years to middle age; half were single and half were married, and their previous occupations varied from office and cinema to warehouse and factory workers. But none of them had any previous experience in the Gas Industry.

These women were given three weeks' training in a large room which was fitted with working domestic gas appliances. Down the centre was a gas rail fitted at intervals with lighting pendants. Around the walls, in addition to live appliances, were sectional models kindly loaned by the manufacturers. In the limited time available the following training was concentrated upon:

(1) Creating keenness, enthusiasm and loyalty, by showing the importance to the Industry of the jobs they were undertaking and the importance of the Gas Industry to the nation.
(2) A brief sales course, including demonstrating.
(3) Imparting elementary technical knowledge.
(4) Practical maintenance.

Mr. W. J. Tipping, to whom we are indebted for this information, observes that he has given similar courses to men who were new to the Industry, and he found that the women compared very favourably. They were enthusiastic, excellent time-keepers, learned quickly, and carried out the practical work in a most satisfactory manner. They were, declares Mr. Tipping, particularly suited to lighting maintenance, and the first day they were put to work on the district they succeeded in securing orders for new appliances.

Each day Mr. Tipping broke off, without notice, to test progress, and he found that the women, as a body, memorized facts and figures better than men did. They also switched from one subject to another without delay or confusion.

Varnish-Drying

THE South Australian Gas Company has just completed the manufacture and installation of two large gas-operated ovens for the drying of copal varnish from steel container in one of the largest manufacturing workshops in South Australia.

The main drying oven, which is 9 ft. long by 6 ft. 6 in. wide by 6 ft. 2 in. high, is constructed of 18 gauge sheet suitably braced and lagged with "Unifil" insulation in the 2 in. cavity between inner and outer casings. Counterweight doors at each end have been provided and floor of oven has been equipped with suitable tracks to facilitate handling of the trucks containing the fabricated work.

Air circulation throughout the oven has been provided by a specially designed multivane fan having heat dissipating discs, and the air is heated per medium of a horizontal gas-fired tubular air heater mounted on top of the oven. The maximum gas rate is 400 cu.ft. per hour and the operating temperature approximately 450° F.

The second oven, which is used for pre-heating the work preparatory to being introduced into the drying-out oven, is a muffle type, the internal dimensions being 9 ft. long by 6 ft. 6 in. wide by 6 ft. 6 in. high. Counterweight door at each end is fitted and the oven is also equipped with tracks for handling of the conveyor trucks. An agitating fan located in the oven ensures equal distribution of heat.

In addition to the above, a large gas-fired spring tempering oven for the heat treatment of car seat springs has been specially designed and installed in these works by the South Australian Gas Company. This oven has also been constructed of mild steel casing on suitable framework, lagged, and contains three separate heat treatment chambers fitted with trays for loading the springs. An air circulation throughout the oven has been maintained by a specially designed multivane fan equipped with heat dissipating discs, the air being heated by means of a horizontal tubular type air heater.

Thermostatic control has been provided, together with automatic safety controls operating through a magnetic gas valve. Maximum gas rate is 600 cu.ft. per hour and the maximum temperature provided for is 750° F. [*With acknowledgments to the National Gas Bulletin of Australia.*]

Use Gas Pokers and Save Paper

In support of the national campaign to conserve wood and paper, the gas undertakings in the areas controlled by the Severn Valley Gas Corporation and Gas Consolidation, Ltd., have for the past month been pushing the sales of gas pokers and portable heaters.

In addition to special literature dealing with the appliances available, managers of associated gas undertakings have been circularized with a leaflet on the following lines:

"Vast quantities of paper and wood are still being needlessly destroyed to light fires. A million tons of newsprint paper can be saved and sent to the mills to be pulped and made into paper and board. The response to the call of the Government for the salvaging of used paper will be tremendously increased if only housewives use the new "twin" gas pokers. These pokers light fires quicker, cheaper, and very much easier, with gas alone. Gas is made from British coal, and much of the raw materials for explosives and other vital war supplies comes from Britain's Gas-Works."

On the reverse is an illustration of a "twin" poker and further appropriate wording. Where possible, window displays include large receptacles in which the public are invited to deposit used newspapers, &c.

Appliance literature has provision made for the insertion of current sales prices. This arrangement eliminates the waste which occurs each time prices are altered. Selling terms for portable heaters, complete with free pokers, are shown on the sheet headed "Poker and Portable Heater Scheme."

British Standards Specifications

Leaded Gunmetal Castings and Ingots

There has in the past been a Standard for only one type of gunmetal alloy, namely—

88/10/2 (copper, tin, zinc) Bronze (Gunmetal) Ingots and Castings (B.S. 381 and 382).

The British Standards Institution have, however, just issued Standards for two further leaded gunmetal alloys of the compositions 85/5/5/5 and 87/9/3/1 respectively. They form the subject of two publications, each of which includes separate Specifications for ingots and castings and the form of the Specifications follows the lines previously established for the bronze gunmetal castings Specifications.

The Specifications have been based on proposals put forward by the Institute of British Foundrymen as a result of a considerable amount of experimental work which was carried out by one of their Committees. It may be interesting to state that the Specifications only provide for test pieces to be separately cast, either in the moulds of the same materials as those used for the castings represented, or in chilled castings. The tensile strength of the 85/5/5/5 alloy is 12 tons per sq.in. and that of the 87/9/3/1 alloy is 14 tons per sq.in.

Copies of these new British Standards may be had from the British Standards Institution, 28, Victoria Street, S.W.1, B.S. 879 and 898, in one volume 2s. 3d. post free, and B.S. 900 and 901, in one volume, price 2s. 3d. post free.

Cold Rolled Copper Sheet

It is rather surprising that so far there has been no British Standard Specification for copper for general engineering purposes, although there is a useful series of Specifications for copper for electrical purposes. This deficiency has now been made good, and a British Standard for cold rolled copper sheet and strip (half-hard and annealed) for general engineering purposes has now been published. This Specification supersedes the Specification which existed in the Aircraft series—No. 2 B.15—for copper sheets for aircraft purposes, and which will now be withdrawn.

The composition clause has been so framed that an arsenical copper can be provided under the Specification if desired. The tensile strength of the material is 17 to 21 tons for half-hard material and 13.5 to 17 tons for annealed material, in thicknesses from 3 S.W.G. (0.252 in.) and thinner, and in widths up to 42 in.

Copies of this new British Standard (No. 899) may be had from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 3d., post free.

Stirrup Pumps and Traffic Paints

Copies of the following recently issued British Standard Specifications (A.R.P. Series) can be obtained on application to the Secretary of The Institution of Gas Engineers, 1, Grosvenor Place, S.W.1:

BS/ARP 33. Stirrup Pumps (price 4d.).

BS/ARP 38. Traffic Paints (price 8d.).

New C.O.L. Plant in Canada

Operating Results

In 1930, the British Columbia Electric Railway Company, who control the gas undertaking at Vancouver, decided to install a plant which would enable Vancouver Island coals to be carbonized efficiently and at the same time cut out the use of the carburetted water gas plant except for peak load purposes. An order was placed with Gas Chambers & Coke Ovens, Ltd., for a 3,000,000 cu.ft. per day installation of their C.O.L. intermittent vertical chambers and some 18 months later a further order was placed with the same firm to extend the plant to 4,500,000 cu.ft.

In 1938, the first installation having then been in continuous operation for some 6½ years, it was decided to reset this plant in stages, 12 of the original 24 chambers being reset at a time.

It was decided that three beds of the Keefer Street continuous vertical retorts, comprising 24 retorts of 36 in. major axis and of a nominal capacity of 900,000 cu.ft. per day, should be converted into three beds of C.O.L. intermittent vertical chambers with three chambers in each bed giving a nominal capacity of 1,200,000 cu.ft. per day. Each chamber has a capacity of 4.25 tons and the throughput of the bench of nine chambers is about 63 tons per day.

Drying fires were started in the producers on May 12, 1939, and the actual drying out of the settings proper commenced on May 23. The first chamber was charged on July 5 and, by July 15 the plant was in full operation.

The coal used is a mixture of 50% Western Fuel and 50% Comox, both from Vancouver Island. The latest available figures during November and December give the following average results:

Gas made per day corrected to N.T.P.	1,140,000 cu. ft.
Calorific value	462.7 B.Th.U.
Coal used (raw) per day	62.0 tons
Therms per ton, raw coal (inerts 25 to 30%)	85.05
Raw coke to producers, per day	14,84 tons
Fuel consumption, raw coke (6% H_2O)	23.95%
" " dry coke	22.5%

Waverley Association

The Annual Meeting of the Waverley Association of Gas Managers, held in the Y.M.C.A. Hall, Edinburgh, on June 28, was presided over by Mr. A. S. Nisbet, formerly Manager of the Paisley Corporation Gas Department, the President. There was a good attendance. The President was supported on the platform by the past President, Mr. David Fulton, Helensburgh, and by the Secretary, Mr. R. J. Philp, North Berwick.

The PRESIDENT made sympathetic reference to the death of two members, Mr. P. R. Chalmers, Kelso, and Mr. James Kincaid, Kirkcaldy. Neither of them had been spared to enjoy their retirement long. They had also lost by death two extra-ordinary members, Mr. Peter Blackhall, of Messrs. Alder and Mackay, Ltd., Edinburgh, and Mr. James D. Whitelaw, of Messrs. Alex. Cameron, Glasgow.

New Members. The following were admitted to membership. Ordinary member, Mr. Sydney Smith, Manager, Paisley; extra-ordinary members—Mr. Kenneth James McKelvie, of Messrs. James McKelvie and Co., Edinburgh; Mr. W. P. Rae, of Messrs. Alder and Mackay, Ltd., Edinburgh; and Mr. R. G. Murray, of Messrs. J. H. Robinson and Co. (Liverpool), Ltd.

The President welcomed the new members.

Election of President. The PRESIDENT intimated that the Council had decided to nominate as their next President Mr. William C. Campbell, of Galashiels. Mr. Campbell belonged to the younger school and was to take up this important office at an early stage in his life.

Mr. DAVID FULTON, Helensburgh, seconded the nomination and Mr. Campbell returned thanks for the honour conferred on him. He realized it was a high honour and he hoped he would have the ability to carry out his duties to their satisfaction.

On the proposal of the PRESIDENT, Mr. R. J. Philp was unanimously re-elected Secretary and Treasurer, the usual honorarium to be paid, the President expressing the thanks of the members to Mr. Philp for his work on their behalf.

Mr. A. Mitchell, Penicuik, and Mr. Robert Cowie, junior, Hawick, were appointed members of Committee for a period of two years and Mr. A. C. Finnie, Duns, was appointed for a period of one year.

Mr. John O'Halloran was reappointed auditor.

The President thereafter delivered his Address.

Mr. DAVID FULTON, Past President of the Association, in presenting Mr. Nisbet with the President's Gold Medal, said that Mr. Nisbet's occupancy of the chair had given the members of the Association great pleasure and pride.

Mr. H. A. AITKEN, Buckhaven and Leven, proposed a vote of thanks to the retiring President and Committee.

During the meeting a collection was made for the British Red Cross Society.

Confidence Justified

At the luncheon in the North British Station Hotel Mr. Nisbet presided.

Mr. Archibald Kellock, Airdrie, President-Elect of the North British Association, proposing the health of "The Chairman," said that Mr. Nisbet's election as President of the Waverley Association had been a fine gesture, popular with the members. It was also a recognition of Mr. Nisbet's great services to their Industry. By his Address the President had justified the confidence reposed in him. It had been his privilege to come into contact with Mr. Nisbet a great deal, especially in the work of various associations and organizations connected with the Industry. From that contact he always had benefited personally. Seven years ago Mr. Nisbet had been President of the North British Association and had filled the office with conspicuous dignity and ability. He gave freely both of his professional advice and his friendship.

Mr. Nisbet, responding, said that seven years ago he acknowledged a similar compliment when he was President of the North British Association. He had said then that there were two great days in a gas manager's life. The first was when he took over the charge of his first undertaking and the second was when by the vote of his colleagues he was invited to preside over their deliberations. They had now given him this third day, which would be for ever marked in his calendar.

Stoves, Ltd., of Rainhill, Liverpool, have issued a revised and enlarged edition of their booklet "Gas Cookery in Wartime." The recipes are planned to get the most out of the food available and to make the fullest use of the cooker—both oven and hotplate. All the dishes have been tried out in the Research Kitchen by the firm's Cookery demonstrators, using the streamline "Newhome" gas cooker, and will be found economical and practical in use.

Copies of this selection of economical recipes and useful hints for distribution to consumers may be obtained by gas undertakings upon application to Stoves, Ltd.

WAVERLEY ASSOCIATION OF GAS MANAGERS

Presidential Address

of

A. S. NISBET, M.Inst.Gas E.,

late Engineer and Manager of the
Paisley Gas Department

Annual Meeting at Edinburgh, Friday, June 28

ALMOST twenty years ago the late Lord Oxford and Asquith, invited to stand as candidate for the Parliamentary representation of Paisley, described his acceptance of the call and his entry upon the campaign as "a dark and difficult adventure," and similar might be the description of your kind appointment of me to be President of your ancient and honourable Association, for it makes departure from precedent in that:

(a) I am no longer in active responsible service in the Gas Industry and

(b) I have not the connexion—professionally or by birth—with Edinburgh or the Border Country, which I had understood was a necessary qualification for occupancy of this high office.

It is true that at the luncheon following last year's Annual Meeting, there was gentle reminder of the latter disability; but my immediate predecessor in this chair had already given to the Industry in Scotland, particularly in the all-important sphere of education, such outstanding service that he might easily be held to have served Edinburgh and the Borders. I do not risk quotation of the mathematical axiom that the "greater includes the less," because the use of these adjectives in such connexion might awaken wrath similar to that outpoured on a distinguished English guest at a Caledonian banquet in London. He was almost dirked because, after a rendering of the "Bonnie Banks," he had unwisely suggested that Loch Lomond did not seem a happy rhyme to "afore ye." And for myself, may I plead that I am at least of Edinburgh extraction in that my father was by birth an Edinburgh man, and he inspired me with love towards, and admiration for, his native city. After all, the appointment of two partial outsiders to preside over your deliberations may be regarded as experimental, and if this year's result does not warrant that repetition of it which last year's did, you have ample district reserve on which to rely.

Change in Practice and Methods

Choice of matter for a Presidential Address is increasingly difficult, and especially so for anyone like myself who is no longer in immediate control of a gas undertaking, and has thus no particular problem on whose treatment and possible solution he may speak, giving his own experience, and in discussion eliciting the views of his professional brethren. So, having arrived at that stage in life when the outlook is backward rather than forward, I purpose to set before you some of the changes in the practice and methods of the Gas Industry which have marked the passage of the last half-century, and invite your consideration of their advantages and disadvantages.

Fifty years ago the duty of a Gas Manager was a simple one. I do not mean "easy;" I choose the adjective in contradistinction to "complex," which I would employ to describe his duty to-day. There were giants in those days as well as now, and many of them were spared to "watch their sandy footprints harden into stone" and to inspire and quicken with the pulse of a new ambition the younger generation which has taken up the torch they carried so faithfully. We gratefully recall names of many outstanding men who by intuition, constructive imagination, and in some instances hard-headed audacity, contributed to the great place of our Industry in the public service.

Gas was then employed almost exclusively as a lighting agent, and although electricity as such was attracting attention, its rapid progress was being held up by its cost and by the introduction of the Welsbach incandescent light. So, the market for gas was a sure one and nearly all buildings were equipped for its use. About that time, the use of gas for cooking was beginning to be appreciated, but Undertakings were cautious in providing costly cooking equipment and in most cases charged a quarterly rent for its installation. Progressive Managers, looking forward and sensing that their principal consumption—that for lighting—was likely to suffer loss at the hands of the newer illuminant, risked the supply and installation of cookers free of hire, and increased gas consumption at once resulted. Of course, there arose immediately the difficulty for a municipal undertaking to discriminate between remunerative use of its appliances and installation of them in houses where the consumption was not likely to yield adequate return on capital expenditure. And here I must crave your indulgence in that I may speak with certainty of municipal undertakings only, and of Paisley in particular. I never served anywhere but at Paisley, and so to those of you whose talents have enriched and benefited several Gas Committees, I fear my opinions and conclusions may appear a little parochial. Well, when Paisley embarked on the "Free Cooker" scheme it safeguarded itself by requiring consumers to sign an agreement that they would use not less than a specified quantity—based on the size of the house—failing which they would pay 6d. per 1,000 cu.ft. for that quantity by which they fell short of their undertaking. There was a surprising number of these "shortcomers" because they used gas as sparingly as possible, foreseeing only the certainty of a largely increased gas account and forgetting to consider the compensating convenience of its source, and when demand notes for the sixpences were issued, there were three types of acknowledgment:

(1) The peaceful consumers paid up and looked pleasant, or at least as pleasant as they could when paying for something which they had not used.

(2) The truculent consumers refused to pay and ordered immediate removal of the cooker, some being rude enough to indicate a suitable destination.

(3) The wise consumers took no notice, and watched, with the satisfaction of the astute, the embarrassment of the Gas Department in finding storage room for the rejected cookers which speedily led to abandonment of any further demand for payment for short consumption.

These last remained in peaceful possession of the new equipment and became a nucleus of satisfied consumers—the best of all advertisements; so, in the end, they doubtless paid their way. But, looking back on the course of events, who will venture to say that the free cooker, although costly, was an unwise experiment, and indeed, but for its effect in popularizing the use of gas for cooking where would our consumption be to-day? It is not possible, of course, because of their seasonal and intermittent use, to be so generous in gas fire installation, but I think the cleanliness and convenience of cooking appliances induced consumers to adopt gas heating as well, particularly in towns where working-class homes have a large female income from factory employment and where the larger houses, because of these good factory earnings, have difficulty in securing suitable domestic help.

And this leads me to justify my choice of the adjectives "simple" and "complex" in comparing the duties of the Gas Manager of 50 years ago with those of to-day. Then he made his commodity, and the consumer took it as a matter of course. There was little choice for him. To-day the Manager, especially in a municipality owning an electricity undertaking, has to fight for every cubic foot of gas he sells. He has the competition of many alternative fuels and interests to face, and he must therefore be equipped not only with the technical ability to run his undertaking successfully, but also with the business training to meet all kinds of people and discuss all kinds of fuel problems. He must ever be ready to give "reason for the faith which is in him." His knowledge must not be locked away at the back of his mind, available doubtless, but only after some fumbling with the key. It must be there on the instant—without blur or indecision or inaccuracy.

Cost of Additional Consumption

Reflection upon this fact brings one to comment upon the recent enormously increased cost both in capital and in maintenance of any additional domestic consumption which is secured to-day. Formerly the cost was merely that of the main and the meter. Now the undertaking has to provide, where required, cooker, wash-boiler, water heater, fire, or some form of space heater. I know that in recent years the cooker

and wash-boiler have come to be regarded as part of the necessary equipment of the house, and as such their cost has been defrayed by the housing authority, while the cost of other appliances is repaid but usually only over a period of years. But, in the earlier housing schemes of twenty years ago, many local authorities insisted that the usual practice of equipment should obtain and that if, ordinarily, cookers were supplied "free of charge" they should continue so to be supplied by the gas undertaking, since it was not concerned with the ownership of the houses but only with the supply of gas to them. Thus, many undertakings were saddled with heavy additional capital cost for cookers in cases where, but for the installation of the interior type of coal grate, a rangeplate would quite adequately have met the need of the consumer.

A further additional cost is the length of main per consumer necessitated by the modern type of house building. Compare a street of good working-class type of tenement housing with eleven or twelve consumers off one service pipe, with the present-day detached blocks where a service pipe meets the needs of only two or four houses and the gas supply has to be carried on by an unremunerative stretch of main to the next block. I remember being one of a deputation which waited upon the appropriate Scottish Department Officials to discuss gas supply to Housing Schemes, and the late Mr. Alexander Yuill, who acted as its spokesman, said quite bluntly that if he did not get the lighting of the streets and houses he was quite prepared to refuse to lay mains for an uncertain return. I sympathized with his view then, although of course one could not persevere in such refusal, and I have often wondered since whether the great housing extensions have been profitable, especially where one was not allowed to make any charge at all for the extension of the gas mains. But they have this in their favour for future consumption—just because there is practically no internal piping and the kitchenette is often the only room with a gas appliance, the gas undertaking has a free hand to run adequate piping from the meter for any new requirement which may develop from showroom or canvassing activity.

A little while ago I mentioned tenement houses having eleven or twelve tenants. If each of these decides to instal an instantaneous gas water heater—and it is extraordinary how A's possession of one of these household conveniences leads to similar enterprise on the part of neighbours B to L—the undertaking is probably faced with the necessity of changing the existing meters for those of higher capacity and also of enlarging the service pipe, because the tenants will all use the heaters at the same time, and only harm can result from installing apparatus without providing facility for its satisfactory employment.

A Burden on the Undertaking

Again, the provision of such appliances is a burden on the undertaking since most of them are installed on hire or hire-purchase. A long experience made me definitely hostile to simple hire, and latterly I endeavoured to supply only on hire-purchase or sale outright. Now, I do not propose to enquire into the ethics of hire-purchase. Whether it is regarded as unsound that people should have an article before it has been fully paid for, or regarded as sound and an incentive to thrift that the article should be provided and paid for by instalments thereafter, the fact remains that hire-purchase of goods has become a part, and a growing part, of the national life, and the Gas Industry simply could not afford to disregard the opportunity it provides of extended consumption. But it carries this disadvantage—that the Industry, especially if municipally owned, cannot quite choose its customers—as a private merchant may, and the danger is ever present that consumers may wish to take on more than they can afford with the result that after a few payments the undertaking has goods thrown back on its hands which can be re-issued only after expensive reconditioning.

For many years a fairly safe rule was not to fit on hire-purchase goods which required a quarterly instalment greater than the excess cash in the prepayment meter. It was, at least, a useful means of checking the ambition of consumers of doubtful financial stability; but one fears that increases in the price of gas necessitated by the abnormal conditions of rating and taxation to-day will severely curtail this useful function of the prepayment meter—a function which you may recall was so delightfully expounded at Aberdeen ten years ago by my good friend and long-time neighbour, Mr. Andrew Walker, of Kilbarchan. But its employment has resulted in quite serious maintenance and inspection costs. Some undertakings have organized a systematic oversight of appliances so that each is inspected at such interval as experience has shown cleaning or adjustment likely to be required, but in view of the fact that a routine visit may be a considerable irritation to a consumer who has not at the moment any complaint to make, I have always felt that any case of dissatisfaction is adequately met by prompt attention on its notification.

The industrial load received a great impetus during the Great War, and however unwelcome a similar cause of increased consumption is, it would be folly to lose the opportunity such as it affords of advancing the claim of gas as purveyor of cheap and convenient fuel for industrial heating. On the principle of the small boy who said, in resigned tones, "If I must be washed then wash me with Vinolia," if armaments must be made, let gas be employed in their manufacture to the greatest possible extent. And this brings me to the question and the anxiety which dogs the ordinary Gas Manager throughout his professional career—"How can I increase the consumption of gas in my area?" The unthinking consumer probably replies: "By selling it more cheaply." It is an unthinking reply because already many consumers are supplied far too cheaply. Their consumption is so small that they fail to provide adequate return on the capital and running costs employed in maintaining them—and the Gas Industry has peculiar difficulty in dealing with this disability. For while yet it had monopoly there had not appeared the need for what we call generally "tariffs" or "price structures" or "promotional rates." It had not been necessary to have a minimum charge for supply or any plan for relating the size of consumption to the rate charged. The whole effort was toward lowering the flat rate; and even to-day any attempt to depart therefrom and price gas on some fairer basis is regarded by many consumers with distrust and suspicion that the poorer—as distinct from the smaller—consumer is being penalized.

No General Scheme Applicable

A tariff is an extremely easy subject on which to speak generally. It is a superlatively difficult matter to design, since no general scheme applicable to all undertakings can be devised. The tariff must be that form of rate structure which, in the opinion of the executive officer, is most suitable to the particular nature of the load in his area of supply. Again I speak with experience limited by service in only one undertaking; but I think that variation of price from the standard, should be dictated alone by the quantity of gas consumed. Other bases of rate structure, such as assessed rental, number of rooms in a house, floor space, or supply (not limited) at a stated charge for any particular purpose, such as domestic water heating, seem to me unnecessary complications which may easily excite dissatisfied criticism.

After all, what does either the purpose for which gas is used or the incidence of its use matter to the gas seller? He is concerned only with quantity, since his storage, with occasional use at peak load of a booster, clears him of the bugbear which so perplexes his principal rival in the distribution of convenient heat. I am moved to this conclusion because, when a promotional rate was introduced at Paisley, it was for motive power only and without guarantee of any qualifying quantity. A year's experience showed the inequality of an arrangement which allowed a small power consumer a more favourable rate than a large industrial one. So the rate was extended to cover industrial load with the qualifying quantity of 150,000 cu.ft. per annum, used through the consumers' own appliances. No alteration was made in the case of the power user. Such course would only have hastened the decline of a declining load which has already almost removed the injustice. Later, downward steps in rate were introduced as the quantity consumed increased, and at the end of year 1938-39 the scale was:

For the first 2 million cu. ft.—			4¼d.	per 1,000 cu. ft. under domestic rate.
next	do.	do.	7d.	do.
next	do.	do.	9½d.	do.
next 1	do.	do.	12d.	do.
next 1	do.	do.	14½d.	do.
next 1	do.	do.	17d.	do.
and for any quantity beyond that			19½d.	do.

Doubtless this scale has weaknesses which open it to criticism; but it has the great merit of simplicity, and its arrangement did bring me welcome proof of its fairness when a large catering firm complained to me that in its principal works it could buy a block of gas at a rate more advantageous than that at which I charged. I was able to show that if it used the block quantity at Paisley the scale on which it would be charged (and of which it complained) would result in cheaper supply than it was then enjoying.

(To be concluded.)

DEVELOPMENTS IN THE INDUSTRIAL FIELD

GAS IN THE CERAMIC AND ALLIED INDUSTRIES

[CONTRIBUTED]

THE increased sales of gas for industrial purposes recorded during the last few years by the Stoke-on-Trent Gas Department are due, mainly, to the developments in the application of gas to the manufacture of pottery. At the same time, attention has been paid to other local requirements, and the results achieved have been obtained in face of severe competition from other fuels. In building up this new load the Gas Department based the work on the firm foundation of consumer-satisfaction and service.

Centred in an area which looks upon the pottery industry as a trade peculiarly its own, and where coal has always been available at very low prices—in some instances the pottery manufacturers are owners of the collieries—the first problem was to convince manufacturers that town gas could do the work equally as well as coal. From whichever angle this problem was examined it was obvious that gas could not compete with coal on a thermal cost basis. Even after making due allowance for the extremely low thermal efficiency (*i.e.*, heat actually transferred to the ware) of pottery kilns and ovens, it was realized that other factors must be considered with a view to providing incidental economies to counteract the additional fuel costs.

When firing glazed tiles and pottery by solid fuel protection must be afforded the ware by placing in saggars, otherwise the fumes and smoky gases damaged the glazes and colours. This means, of course, that the protecting and supporting materials must be raised to the same temperature as the ware inside and is one of the causes of the low thermal efficiency of solid fuel firing. With clean town gas of low sulphur content the protection can be largely eliminated, and the ratio of weight of supporting material to weight of ware reduced by a considerable extent. At the same time a guarantee can be assured of better finish and less spoilage. These advantages, coupled with the fact that through the medium of tunnel kilns and ovens production becomes a continuous process, have made gas firing an economic proposition which the manufacturers have not been slow to adopt.

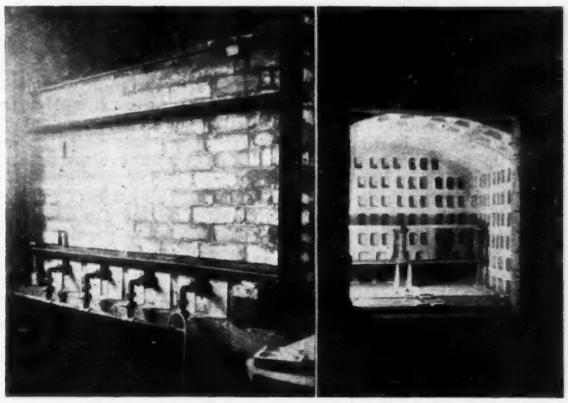
Apart from the actual firing of pottery, electrical porcelain, tiles, &c., there are many processes in the ceramic industry which require the application of heat. Having solved, with the assistance of manufacturers and furnace engineers, many of the firing difficulties and problems, the Gas Department turned to ancillary processes such as clay-drying, mould-drying, heating of presses and printing machines, colour manufacture, &c. Since, as with firing, every manufacturer has his own idea of how the work can best be done, it has seldom been possible to adopt a standard method of applying town gas to any particular process.

One factory, for instance, may require an output of 4 tons of dried clay per day while a similar factory demands 40 tons daily, and the degree of drying may be subject to an equally wide variation even on one factory. Similar problems arise in connexion with the drying of cast ware depending on the constituents of the clay from which the ware is cast. Drying ovens vary from small units to large chambers and mechanically-driven continuous machines, and the methods of heating from flat-flame burners to unit type air heaters. An interesting feature is that every form of heating used has been designed and, with one exception, made in the workshops of the Stoke-on-Trent Gas Department.

One of the most important processes ancillary to the ceramic industry is the firing of the frit from which glazes are made. These glazes are similar to the enamels used for the vitreous finish of gas cookers, &c.; in fact, most of the enamels used by appliance manufacturers are produced in Stoke-on-Trent.

Frit melting is essentially a high temperature process, and the various constituents, flint, felspar, clay, stone, borax, &c., must be heated to melting point and held at that temperature for a sufficient length of time to ensure perfect mixing of the materials, following which the molten mass is run out of the furnace into special cooling vats. Frit kilns may be of the mechanically-driven rotary type or intermittent batch type. A number of the rotary type have recently been converted from oil-firing to town gas with remarkably good results.

Most manufacturers express a preference for the batch type, the capacities of which, as a rule, vary between 2 cwt. and 15 cwt. per charge, and the usual procedure is to keep the kiln in continuous operation—*i.e.*, to recharge after each pouring, until the kiln collapses or is burnt out. The life of the furnace is an important factor in the cost of the finished frit, and the Gas Department has paid much attention to the designing of town gas-fired kilns with a view to firing at a cost comparable with solid fuel, and also increasing the life of the kiln. Results obtained



Muffle Furnace designed for a special process in connexion with the decoration of glass tableware

over a period of some months with batch type kilns of a capacity of 10 cwt. per charge show a distinct saving in time and fuel costs. Modifications now being made are expected to produce equally good results in prolonging the period over which the kilns can be worked.

Although Stoke-on-Trent can scarcely be described as "a city of a thousand trades," the pottery industry is by no means the only industrial activity which has received the careful consideration of the Gas Department, which, by personal contact and suitable literature, keeps in close touch with all industrial and commercial consumers.

Mention was made earlier in this article of the service rendered to manufacturers. The illustrations show a furnace with built-up muffle measuring 2 ft. 9 in. high, by 5 ft. 9 in. deep, and 2 ft. 6 in. wide, designed for a special process in connexion with the decoration of glass tableware. Drawings were prepared, quantities worked out, burners made, and the furnace built and in operation within 5 days of the enquiry being received by the Department.

NEW GAS-FIRED BISCUIT OVEN

A REEL type gas-fired biscuit oven recently installed in the premises of Sydney Flour Pty., Ltd., by the Australian Gas Light Company, is stated to be a decided advance in ovens of this type and is used for the baking of flaked wheat cereal biscuit, which are loaded on metal trays each 4 ft. by 3 ft. The total capacity of the oven is 64 trays holding 896 dozen biscuits which, for this particular product, are cooked at the temperature of 275° F. for a period of one and a half hours.

The oven has a remarkably low holding rate of 220 cu.ft. of gas per hour at 275° F. in spite of its large dimensions, 14 ft. high by 12 ft. wide by 14 ft. deep. The operating mechanism for the reel is entirely automatic, comprising worm reduction unit, automatic holding brake and stop, start, and reverse control on the motor which ensures that on pressing the stop button the heavy rotating mass of the reel (approximately 2½ tons) will come to rest within a few inches, which enables easy loading and unloading of the oven.

Of double cased construction with 16 gauge enamel steel sheets, the oven is insulated with 6 in. thickness of "Unifil" insulation and is heated by two air-blast pipe burners each 10 ft. long with approximately 250 flame retention tips per burner having a maximum input of 1,100 cu.ft. per hour. The burners are equipped with safety pilots—to shut down the equipment in the event of pilot failure—automatic temperature control and recording thermometer. An A.G.L. proportional mixer ensures the correct proportion of high pressure fan air and gas under all operating conditions. Close attention has been paid to the finish of the oven, and its cream enamel and chrome-plated cover strips harmonize with the modern hygienic daylight factory in which it has been installed. [*With acknowledgments to the National Gas Bulletin of Australia.*]

DEVELOPMENTS IN THE INDUSTRIAL FIELD

GAS AS A FUEL—RECENT ADVANCES*

By A. J. CRUISE,

of Messrs. Preston and Thomas, Cardiff

ONE of the most important major developments has been the introduction of "recirculating air heating" equipment for a vast and ever-increasing number of processes between temperature limits of 60° F. and 1,250° F.

Briefly the system contains a heating unit which may or may not be an integral part of the working structure, a fan, and means of conveying the air and gases to and from the working space. Combustion takes place in a heating unit and air is either heated directly or indirectly according to the requirements of the process. The air or air plus products of combustion are forced by a fan into the working space around or through the material to be heated and are withdrawn after transferring their heat. They then pass back to the heating units where they are reheated to the required temperature and recirculated with fresh combustion products and air, or air only if indirect heating is used.

The whole 100% of the products cannot be recirculated continually in a direct system since it would then be impossible to take in the fresh air necessary for combustion; but from 70% to 80% can be re-utilized under certain conditions. In the same way certain processes, notably those of drying, &c., cannot be operated with full recirculation of the air or products owing to the fact that the vapours absorbed in the process have to be vented. Despite these factors, however, the operating efficiencies obtainable are definitely greater than those obtained with older straightforward methods of heating.

Maintaining Velocity

The slowness of natural convection arises mainly from the tendency of the films of heating gases to adhere to the work or the heat transfer surface long after their useful association with it is over. These thin films of relatively cold gases have extremely low thermal conductivities. Hence the retarding effect of their contact with the work or heating surface. These can be avoided if the velocity of the heating gases is maintained well above the critical figures and in the "turbulent flow" region. The apparatus can be made much smaller since the normal combustion chambers and the massive construction associated with heat radiation are obviated. The heater can be arranged for the incoming cold air for combustion to be drawn around the outer casing, thus insulating it and being preheated itself. Thirdly, much more even temperatures can be obtained since the working gases need only be supplied slightly above the required temperature. Their swift removal and replacement almost constitute constant temperature conditions and certainly produce even heat inputs and uniform heat penetration. The methods controlling temperatures either manually or automatically can be applied to this system as well as to the others.

We can thus assess the benefits of this system to the Industry as follows:

(1) Increased efficiency of utilization.
(2) Better production conditions.
(3) More accurate temperature control.
(4) Accelerated heat transfer.
(5) Reduced weight, size, and cost of appliance.
(6) Heating equipment can be located anywhere convenient if not desired in or on the working portion.
(7) Extremely wide temperature range of service.

Immersion and Radiant Tube Heating

Immersion heating consists of means of supplying a mixture (approaching theoretical efficiency) of gas and air under pressure which is high enough to provide the hot gases with a velocity great enough to overcome the resistance of the units. This mixture is combusted in individual heating units formed of suitable materials to resist any corrosive action by the material being heated and to withstand the effects of temperature from the burning gases.

The shape and disposition of the units in a bath are determined by the particular process used. In the same way the type of burner equipment and the use of entrained or premixed air for combustion is also determined by the nature and temperature range of the operation. These are essential points. As the range and adaptability of the units available are so wide one can be sure of finding a suitable type of equipment for each and every process.

Immersion heating allows us to utilize gas at much greater thermal efficiencies. It thus offers greater economy to our consumers. The thermal efficiency of the process is increased by about 40%. The "flywheel" effect of heat retention by a mass of insulating and structural refractory is obviated. This produces much more accurate temperature control and completely avoids "time lag" inevitable with older equipment. The life of baths or tanks is prolonged more or less indefinitely since the overheating and maintenance of "forced heat transfer" is no longer necessary. The surface oxidation of metals during melting and holding periods is minimized by the reductions in temperatures and sometimes by the use of relatively inert waste gases to pass over the metal surface. The heat lost in warming up brickwork settings is avoided and radiation from these high-temperature surfaces is abolished. Furthermore, the containers can be supported in a better manner and can be completely insulated. Finally, heating surface can be designed to suit production, and operating results can be predicted with great accuracy.

By burning specially prepared mixtures of gas and air under the required pressure conditions in tubes formed of heat resisting alloys, we are able to develop a radiant heating element which for economy, durability, and thermal concentration negatives the inherent advantages of electricity. These units can be formed and disposed in appliances to provide the correct heat transfer. They are sealed and the whole of the products of combustion move in a closed circuit either with or without some sort of recuperation or recirculation, until the waste products are eventually exhausted to atmosphere outside the appliance. In almost every case where they have been installed substantial increase in economy has resulted. We have therefore another enormously important tool for use whenever it is advantageous to keep the products of combustion from coming into contact with the products being heated.

* From a Paper to the Wales and Monmouthshire Junior Gas Association.

OVERHEAD RADIANT HEATING*

By

K. G. ECCLESHARE, of Bristol

OVERHEAD radiant heaters are of two classes—(1) the low temperature radiant panel, and (2) the surface combustion radiant heater. The low temperature radiant panel is manufactured by Bratt Colbran, Ltd., and is supplied in three shapes: (1) rectangular, (2) bowl, (3) wedge.

The gas consumption is the same for all three types, 12,500 B.Th.U. per hour, and this is controlled by a governor fitted to each heater.

Generally each unit has individual control through a Newbridge switch, but on large installations it may be advisable to have a number of heaters under one control, in which case Sugg positive distance switches are used. Thermostatic control can be fitted in either case, utilizing an air thermostat operating through a relay valve in the main gas supply to the units. These units have been found very useful for fitting in lofty buildings such as churches and meeting halls, where, with ordinary floor level radiators cold downdraughts occur, or where floor space is valuable, as in garages and dance halls.

For garage installations a modified wall pattern panel is used, in which the air inlets and flue outlets are covered with double gauzes of stainless steel on the principle of the Davy lamp, to obviate the risk of fire. This heater has been approved by the Factory Inspector in Bristol as suitable for use in premises where inflammable liquids or vapours are present. In one large garage in Bristol the owners were faced with the problem of providing heat for their employees, who were occupied mainly at benches round the walls, without heating the central space in the garage. In this case panels were fitted on the walls, over the work benches so that the direct heat was projected on to the workers, and this has proved quite satisfactory.

The installation of the units should present no difficulty provided local conditions are studied before any work is commenced. It is advisable to obtain complete plans of the building, indicating all major structural points such as girders, or any obstructions before deciding which type of heater is to be fitted. From this plan it will be possible to calculate the maximum heat requirements in B.Th.U. per hour for the building, but for the disposition of the heaters an allowance of 200 sq.ft. of floor space per unit can be made. As the wall pattern and wedge heater will serve an area of approximately 16 ft. by 13 ft. and the bowl pattern a 14 ft. by 14 ft. square the final choice will probably be varied, the wall pattern serving the outer areas with wedge or bowls for the centre.

* From a Paper to the Western Junior Gas Association at Taunton on June 15

DEVELOPMENTS IN THE INDUSTRIAL FIELD

To maintain the heaters in good condition an annual overhaul is necessary, when the whole unit should be dismantled and cleaned. Any broken jets can be replaced, pilots cleaned and governors inspected; after reassembly the pressure should be checked and re-set to give the correct consumption. If this work is carried out properly no more attention should be necessary, although an intermediate inspection is always advisable.

High Temperature Combustors

The high temperature combustor manufactured by Radiant Heating, Ltd., is supplied in two standard shapes, circular and rectangular. The combustors are designed to give maximum effectiveness with a surface temperature of 900° C.

As this type of brick is designed to work on a complete air gas mixture, either a supply of air under pressure must be provided or high pressure gas must be used. In Bristol only low pressure gas and fan supplied air systems have been installed. The air supply is obtained from a low pressure fan, driven by a fractional horse-power electric motor, which gives a pressure of about 6 in. W.G. at the outlet, this pressure is reduced to 20 tenths W.G. at the heater by a regulating valve before passing to the mixing chamber. The fan motor circuit is connected with an electric thermostat which operates by the room temperature, breaking the circuit when the desired conditions are attained. The gas to each unit is controlled by a small governor set at 15 tenths W.G., and a fixed orifice, which ensures a constant volume supply to the mixing chamber. In addition to the air pressure operated control valve, a back pressure valve is fitted on the outlet of the meter, followed by a main governor which serves to keep the pilot settings constant and damps any large variation in pressure that may occur in the district supply. This system requires three pipelines, one for the air supply, one for main gas line, and one for the pilots. The units should be suspended between 10 ft. and 12 ft. from floor level, 10 ft. being the minimum height if even heating is required and overheating of any individual is to be avoided. In certain instances a difficulty may arise from the fact that the height of the building does not allow sufficient head room above the heater, at least 6 ft. being required between the heater and the ceiling. In cases where this space is not available air sprays may be fitted over the units. These sprays consist of a separate lead from the air main to a spray device fitted under a curved deflector along the top edge of the heater unit. The air from the spray picks up the products of combustion, and cools and dilutes them before dispersing them at each end of the deflector, this prevents any direct heat reaching a ceiling in close proximity to the units. The spray can only be fitted to the rectangular type of brick. An allowance of 1 sq.in. of heater surface for every 5 sq.ft. of floor space is sufficient to give satisfactory results, each square inch of heater surface burning 375 B.Th.U. per hour.

A First Installation

The first installation of this type in Bristol was in a new extension to a large firm of engineers, who in 1936, when the question of suitable heating equipment was under consideration, asked the Industrial Department of the Bristol Gas Company to submit a scheme for gas-fired equipment which was capable of maintaining the conditions required by the Factories Act. The building had a total capacity of 365,920 cu.ft. and the calculated heat requirements were 620,000 B.Th.U. per hour to maintain a temperature of 60° F.

Various methods of heating were considered, including hot water circulation and air heaters and eventually a scheme consisting of 40 circular radiant heaters was submitted to the firm for consideration. The main points stressed in favour of this form were speed of heating, economy of gas and floor space, ease of control and the assurance of a supply of fuel, without the encumbrance of large storage space. In face of strong competition from solid fuel and oil, instructions were received to proceed with the installation and the work was put in hand while the building was in the course of erection, which obviated the necessity for cutting walls and negotiating permanent fixtures.

The second order received for a similar installation from another firm of engineers was by no means as straightforward. The works are in an old two-storey building with only 13 ft. head room on the ground floor, and to complicate matters most of the available space is taken up with pulley shafts and the attendant driving belts. In the circumstances it was decided to treat each floor as a separate unit, each having its own fan and controls, 23 heaters being fitted on the ground floor and 24 on the upper.

As examples of the versatility of application further installations have been fitted in a bakery, an office and showrooms, a brewers bottling department, a boot factory, and a furniture store shed. The largest of these installations is in the boot factory and consists of 62 of the largest heaters. In this case the installation has been split into two sections each with separate fans and thermostatic controls, and one of the sections is again sub-divided, a number of the heaters being controlled by a third thermostat operating a magnetic valve in the gas line. This course was taken because some of the workers were engaged in fairly active work, while others were seated at machines and required a higher temperature for comfort.

Although in every case results were good from first lighting up, troubles were experienced during the first two seasons' working, but eventually these were overcome and now it is possible to say that, given reasonable attention, the installations will give satisfactory results from the beginning of the heating season until the end. Some of the faults were of a very minor character and were usually found to be due to mal-adjustment in one form or another.

Each summer, when the heaters are idle, the whole installation is dismantled, the bricks are washed thoroughly and replaced. Pilots are overhauled and governors examined; then at the beginning of the heating season all the units are adjusted and set to work at their maximum efficiency. A further inspection call is made about half way through the heating season when any necessary adjustments are made. There are mainly of a minor character, caused by vibration altering the setting of the regulating valves

Running Costs

The running costs over the last two seasons have proved very reasonable and compare very favourably with any other system of heating, as the following figures from one of the installations show:

Space heated	365,920 cu. ft.
Floor area	17,780 sq. ft.
Roof area	9,260 sq. ft.
(Corrugated asbestos lined with tongue and grooved board with 3 in. air space between.)	
North light glass area	5,870 sq. ft.
9 in. brick wall area	8,728 sq. ft.
Inside temperature maintained	60° F.
Heating equipment	40—C.72 Radiant heaters
Normal working day	7 a.m.—5 p.m. (10 hours)

Gas consumption for season 1937-38 (equivalent to 30 weeks after allowing for overtime)

Month.	Average outside Temp. ° F.	Consumption (Therms).
November	—	456
December	44	945
January	42	1,375
February	45	1,236
March	46	1,109
April	49	547
		5,668
Average consumption per week		189 therms.

In comparing the two forms of overhead radiant heaters mentioned in this Paper, each will be found to have some advantages for particular circumstances. The low temperature panel has the advantage that it requires no filter or electrical equipment for its operation, and is absolutely silent in all cicumstances, whereas the high temperature combustor must have electric power and where air sprays are fitted a slight hissing is apparent. As the consumption of the low temperature panel is considerably less than the high temperature unit, more panels must be fitted to give the same results and heating up is not so rapid.

With regard to installation costs the combustor unit itself is not as costly as the low temperature panel, but requires more ancillary equipment, but as fewer units are required the final costs for either installation would be fairly close. The amount of pipe work for the high temperature equipment can be reduced by utilizing high pressure gas instead of low pressure gas and air mixture. This cuts the piping to one main supply line and a pilot line, but for medium-sized installations this does not prove as advantageous as at first appears. In most cases it will be found that the additional cost of suitable compressing plant, as compared with the cost of fan equipment, is more than that of the extra pipework required by the low pressure system, apart from the higher running cost for electricity and cooling water required. On a very large installation under one set of controls the balance would probably favour the high pressure system, but up to 50 units this is not apparent.

Gas Immersion Burners have been supplied by the Gas Supply Company for the bottle-washing machine at an aerated water factory at Mackay, Queensland. The temperature of the caustic solution has to be maintained at a figure of approximately 130° F., and the monthly gas consumption will average approximately 22,000 cu.ft.

A Drying Oven measuring 24 ft. long by 22 in. wide by 4 ft. 6 in. high has been installed at the works of James Bell Mineral Products Pty., Ltd., Melbourne, for drying sound-absorption tiles. The material to be dried is loaded on to trucks which are pushed through the tunnel continuously. Warm air at a temperature of 45° C. is circulated through the oven from the heater and fan unit mounted on top to save floor space. Automatic temperature and safety controls to permit continuous and unattended operation are a feature of this and all gas-heated drying plants. This automatic operation ensures uniform production of all work. Although the use of gas-heated drying rooms during the day speeds production, time clocks can be easily fitted for night running without increasing operating costs. The selection of gas as the heating medium for this oven follows on the successful and economical operation of other gas-fired units installed by James Bell Mineral Products Pty., Ltd., during the past four years.

Society of Chemical Industry Discuss

GAS LIQUOR DISTILLATION

By F. H. PEAKIN

Discussion on the Paper which Dr. Peakin read before the Birmingham and Midland Section of the Society of Chemical Industry ("JOURNAL" of June 19 and 26)

Dr. **E. W. Smith** (Woodall-Duckham Companies), in the course of a written contribution, said the Paper was of extreme importance to those concerned with the operation of ammonia stills, and the Author had carried out a very valuable piece of work in establishing the relationship between the partition coefficient of ammonia in the gas and liquid phases and the pH of the solution. It would be agreed that his conclusions were sound and that their practical application would lead to the working of ammonia stills under the most economical conditions from the viewpoint of the proper balancing of the lime and steam consumptions. The work in connexion with pyridine was equally interesting. It might be doubted whether anyone had previously shown how small the solubility of pyridine was in a saturated solution of ammonium sulphate. Dr. Peakin's advocacy of distillation with ammonium chloride for the determination of the excess lime in the effluent from ammonia stills was supported.

Mention was made, said Dr. Smith, of plants working at a pressure of 1½ to 2 atmospheres. This was unusual, and it would be of interest to have more details. The utility of the titration curves would be increased if information were provided as to the volume and exact composition of the liquid.

This was particularly the case as regards Fig. 4, which related to ammonia—still effluent. It is not evident whether the effluent was clean or whether suspended lime and/or calcium carbonate might have been present. The effect of the buffer action of the dissolved calcium salts was shown in a very illuminating manner. Further information in connexion with Fig. 5 would also be welcome. The high pH of the untitrated liquid suggested the presence of some lime or soluble alkali in the chalk.

Mr. **P. Parrish** (South Metropolitan Gas Company), in a written contribution, said that what was impressive about Dr. Peakin's investigation was the relationship of pH value to distillation, particularly as affecting limed liquors, and the economy in the use of cream of lime which could thus be effected. What was gratifying to Mr. Parrish was to have confirmation of the deductions which he drew as far back as 1924, from the work of Piron. For the last 14 years they had never used more than 95% of the theoretical quantity of cream of lime, because from the work undertaken many years ago it was found that the fixed ammonia could be converted by base exchange to free ammonia, and a satisfactory effluent obtained.

A Correct Treatment

Mr. **C. Cooper** (W. C. Holmes & Co., Ltd.) said there did not seem to be much question that the treatment of the general subject of relation of partial pressure to composition and degree of pH in the Paper was a correct one. It was generally assumed that the stripping of the liquor went on as if the partial pressure held good as a straight line Henry relationship. At any rate, this appeared to be the case for the section after the lime had entered. It was, of course, much easier to calculate the probable course of events if one was able to assume a simple partial pressure law.

Similarly, it was assumed to be the case that once a certain excess of lime was present, the pH could not be further raised. The curve in Fig. 4 related, he imagined, to an effluent containing CaO in solution only; the excess of lime used in practice would go further than this narrow limit of excess.

It would be interesting to know the method recommended for lime addition by the Author, and particularly the means of keeping the excess at a minimum. At present the general practice appeared to be to use an excess of the order of 15% to 20% to cover up mistakes and irregularities. In some American works there was in use a solid lime feed apparatus which required granulated lime. Enquiries made in this country some time ago showed that such granulated lime was not available, though a powdered hydrated lime was offered. It appeared likely that a closer approximation to theoretical lime requirements could be obtained with such reagents. The actual cost of a 20% excess lime as against 10% excess may be about 7d. per ton on sulphate made. The value of the possible increase in make through its use would have to be assessed for a particular case.

The part of the Paper dealing with the steam requirements was of particular interest. The Author quite properly stated the function of the steam as providing a vehicle for evolution of ammonia into a gas phase, as distinct from the heating of the liquor, and providing for heat of dissociation. There was, however, a feeling that the statement that effective distillation of liquor has been accomplished by 14% by weight of steam at a pH of 8 called for further explanation. He mentioned this because it conflicted with the general estimate that the steam demand was roughly obtained from the distillation constant, at a given pH, and it suggested that in practice the distillation equilibrium was more favourable than this latter assumption estimated. When the disadvantages existing in the practical working still were considered, such as the heat losses, the dilution by milk of lime, the limited number of still trays, and the necessary failure to get equilibrium conditions on each tray, the discrepancy seemed greater.

Estimates of Steam Requirements

To illustrate this point, he had made some estimates of the requirements of a still to be designed to strip 2% ammonia down to 0.02% ammonia, assuming bubbling trays of varying efficiency, and using quantities of steam beginning with the minimum prescribed by the distillation constant. It was not proposed to state all the possible variations that might arise, but the following statements were significant.

Using exactly the minimum steam, but employing a still with 100% efficiency per tray, the number of effects would have to be 99. With 1.5 times theoretical minimum steam, nine perfect trays only were required, and a steam ratio of 2.0 times, six perfect trays. The number of trays would be increased roughly in inverse proportion to the tray efficiency actually existing. Thus at 0.5 completeness of transfer per tray, the nine trays would become about 18 and the 6 about 12. These were figures within the order of practical result quoted with the conclusions from the distillation constants.

The curve in Fig. 7 gave for pH 8 a distillation constant of 6. Thus the distillate of 2% liquor would contain two parts ammonia and 14.7 parts of water under theoretical steam conditions, which could not be reached with any 12 tray column, quite apart from external or practical considerations. It appeared that either the high temperature and pressure in the working still head, or some other departure from the conditions of the bench determination must be responsible. The effect of dissolved calcium salts quoted was greater than one might be inclined to expect; a distillation constant increased by 1.5 times by some such means would approach a reconciliation of the figures.

Another little difficulty was presented by the fact that while the Henry relationship for 100° C. was found to be linear (Fig. 6), implying an independence of pH set up by ammonia, there was a change in the distillation coefficient with pH (Fig. 7). That was, although rise in concentration of lime could effect the Henry coefficient, rise in concentration of ammonia could not, at any rate at the boiling point. The explanation might, of course, be a quite simple one. These considerations were important for studying the conditions in stills removing the free ammonia only.

The Author's Reply

The **Author,** in reply to Dr. Smith, pointed out that the experimental data were obtained at atmospheric pressure, whereas the gas pressure in an ammonia still was usually 7 lb. or more above atmospheric. Fig. 4 referred to the titration of 100ml. effluent with deci-normal hydrochloric acid. This sample had been treated with lime to nearly 50% excess, and the titration served to show that a large excess of lime did not produce a very high pH. For Fig. 5, freshly precipitated chalk was used, and, as Dr. Smith pointed out, it showed same retained alkali.

The Author dealt with the points raised by Mr. Cooper. By maintaining a constant strength of milk of lime in a suitably large mixing vessel, by pumping at a steady rate, and particularly by ensuring a constant rate of gas liquor feed to the still, a narrow margin not exceeding 10% of excess lime was possible, the chief variable then being the fixed ammonia content of the liquor. Nevertheless, a fully automatic lime addition controlled by the pH of the effluent was very desirable.

Mr. Cooper had commented on the very low steam consumption of 14% reported in the Paper, pointing out that was approximately the theoretical figure required by pH 8. This in the Author's opinion, could be explained by the fact that when enough lime was added to ensure a pH of 8 in the effluent, the pH of the liquor in the upper parts of the still was higher, and a sufficiency of steam was therefore available to supply thermal losses. It was only in the final stage of stripping that the pH sank to 8.

Dealing with Mr. Cooper's last point, that the different pH values of pure ammonia did not seem to affect the Henry relationship, it was pointed out that the pH values of ammonia solutions over the concentration range studied did not vary much, and only a small correction for ionization was found necessary by Calingaert and Huggins to calculate a satisfactory Henry relationship. The buffered solutions obtained by liming and partly stripping gas liquor had a considerably lower pH range than pure ammonia solutions of similar NH_3 content.

HOLDING CORPORATIONS AND AMALGAMATIONS

By
F. R. G. GRANT,
Engineer and Manager of the St. Ives Corporation Gas Department.

From a Paper to the Cornish Gas Association, June 19

IF the Gas Industry is to continue to use the nation's greatest asset, coal, to the best advantage and to obtain more from it than any other industry, we must see that those undertakings and there are many, which are too small as well as lacking in the necessary technical advice and therefore not in a position to extract every ounce of value, have the benefits which those large undertakings are in a position to give them. If geographically possible, they might be grouped so that they could afford to have the plant and skilled staff essential for this purpose. There is nothing novel in this idea. The London Companies absorbed works in Greater London and outside. There were others, such as the British Gas Light Company and the Devon Gas Association, as well as some privately owned in different areas.

The first holding company was, I believe, the South Eastern Corporation, and this was followed closely by Associated Gas and Water Undertakings. Both these Corporations acquired works in districts with a view to centralization or amalgamation. Then came a number of holding corporations which were getting a controlling interest in works large and small in totally different parts of the country and even overlapping each other's areas. Many engineers, myself among them (as a matter of fact the National Bodies were non-committal on the subject) began to wonder what this new move was leading up to, and were totally opposed to the idea. One was inclined to ask, is it purely financial? Is it going to have the backing of the best brains in the Industry? When will amalgamation start? Are the smaller works going to receive the full benefits they would become entitled to in the way of technical advice and help? And last, but not least important, where does the consumer of gas come in? Remember this fact, they are the Industry's final judges. Are they to have cheaper gas? Time alone would tell.

What I fail to see is this. When two or three corporations are overlapping in the same area, how can amalgamations be brought about so as to link up works and enable gas to be supplied over a large area from one centre? If that cannot be done it is hard to understand how it can be in the interests of the Industry at all. This linking up and centralization could, of course, take place in time by corporations which have taken over a large individual area, such as a county or part of a county or a wide area in adjoining counties.

It will no doubt be contended that a corporation which has a controlling interest in a number of works, though scattered, can buy centrally for the whole and so get better and cheaper terms. This is no doubt true, but can it be proved that these undertakings have reduced the price of gas to a greater extent than adjoining works which have not been absorbed? I doubt it very much. It will also be claimed that all these works are getting the best technical advice—so making them more efficient. That is certainly a step in the right direction, but when that advice has to come from a centre, perhaps hundreds of miles away, and must at times entail personal visits, the cost must be fairly heavy. At the same time it must be recognized that that advice is of the greatest value to the undertaking and also to the consumer. All this may be critical of a system which may prove eventually to be of the greatest value to the Gas Industry. It is intended to be so. After all, the holding corporation, as we know it to-day, is a comparatively recent factor in the Industry and one which I hope will tend to give it a more solid front when up against competition.

Value of Grid System

I now turn to what, in my opinion, should be the the real outcome of the holding corporation. The West Yorkshire Gas Grid, to my mind, is real amalgamation and linking up, and is making for and getting the greatest efficiency in the distribution of gas. It cannot, as we all know, be done from the collieries alone, but it can be done from different centres throughout the country, either by the extension of large central works or building new works in convenient centres. This would cost money. So did the Yorkshire Grid. Of course there is a limit as to how far it is financially sound to convey gas by means of high pressure mains, but that is a problem for the technical expert.

The electric grid stretches far and near taking in towns and villages, even hamlets and farms. This should be the aim of the gas grid. The whole population of the country is as much the interest of the gas as it is of the electricity industry, and it must be remembered that the domestic consumer is still the backbone of the Gas Industry. There are no doubt many small and medium sized works which are doing quite well and fighting competition as it comes along. With the right help they would undoubtedly do better. There are also those which, especially in these times, are finding it difficult even to carry on. Gas is being sent out in places at pressures totally inadequate for present-day requirements and many works have neither the means nor the capital to overcome this difficulty. In these days of such keen competition, you will agree that this is a very bad state of affairs.

Here again the holding corporation can step in, but always with the idea of linking up. I believe that when a works or a number of works are closed down the saving in salaries, wages, and other charges should be enough to pay the interest, or most of it, on the capital involved, chiefly in mainlaying or installing a high-pressure scheme.

In Great Britain there are 1,131 gas undertakings. Of these, 623, or about 54%, are making less than 50 millions a year, and of that number 415, or about 66%, are making less than 20 millions per annum. To put it more clearly, upwards of a third of the total undertakings in Great Britain have individually a make of gas of under 20 millions a year. Surely it must be the case that these undertakings, to say nothing of those making less than 50 millions, cannot afford to have either the plant or the staffs to get the utmost from the nation's greatest asset, coal, nor are they able to give that service and advice both of which are the right of the consumer of gas. Science and the chemist are as essential to the small works as to the large one if the Gas Industry is to go ahead and prosper, but as conditions are now that is impossible. Competition is keen and can only be met and overcome if the Gas Industry can offer something better. It can do that providing there are no weak links in the chain. The cutting out and scrapping of these weak links is, in my opinion, the task of the holding corporations. They have the opportunity of making a great Industry greater than ever before.

When the war is over many men will be looking for work. I believe the holding corporations, by means of amalgamations, can take a big share in finding that work. Much planning can be done in advance. There is one thing that holding corporations can do for the Industry, and from what I have heard they are trying to do, and that is pay adequate salaries to the officials they employ. Their influence in this respect would go a long way towards removing what has been for many years, in some areas, a disgrace to such an important and vital Industry. If the Industry wishes to attract and retain the right men, this is imperative.

In my opinion, the amalgamation, grouping, or linking up, call it what you like, of small and medium-sized works, and even larger ones, is bound to come sooner or later, and I fancy sooner rather than later, in the best interests of the Industry.

Gas Drying at Kirkintilloch

From a Paper by T. Stirling to the Scottish Junior Gas Association (Western District)

In the year 1933 my chief, Mr. J. Dickson, considered that it would be advantageous to install at the Kirkintilloch Works a benzole recovery, naphthalene removal, and gas drying plant, which plant has been in continuous operation since September of that year with but minor and infrequent stoppages for adjustment, &c.

This action was not merely determined by the market value of benzole, but also by the motive of giving trouble-free service to our consumers. Stoppages due to naphthalene and water in the mains and services of our area were placing a great strain upon the resources, time, and temper of the executive—this, of course, particularly in the cold weather. It was also an increasing burden of expenditure as the area of supply widened.

The plant is a Holmes "Dri-Gas" using calcium chloride solution. Having described the operation of the plant, the Author went on to say:

It is a point of controversy among engineers whether steel mains should or should not be used. All are agreed, however, that if the pipe is liberally coated and wrapped, immunity from external corrosion is assured, at least for a considerable period. But the problem of the steel main is whether its life will be as long as that of the cast iron main, because of the internal corrosion that must accompany the distribution of saturated gas. If, however, dry gas is being distributed, with or without oil atomization, the life of the mains would be much prolonged and their capacity would not be lessened by accumulation of rust or deposition of water.

With dried gas the necessity of pumping syphons and emptying drips is removed, though it is a wise precaution to inspect these periodically when an unusual accumulation of moisture will give an indication of the probable existence and position of a leaky main. I would instance here some proof of the efficacy of our plant to remove moisture. At a distance of some 500 yards from the works is fitted a syphon on a low-pressure trunk main. Time was when this syphon and that at the holder had to be pumped very frequently, sometimes twice a week, and I recollect that in the case of the syphon outside the works something over two hours has been required for the job. This occurrence was not frequent but it was

regular and in any case the syphon had to be pumped every week. Whether or not it is permitted to run the liquor down the drain, the pumping of syphons is not a desirable feature of gas distribution and does not serve to enhance the reputation of the Undertaking in the eyes of the public.

In 1936 a socket welded steel main was laid for the Glasgow Corporation Public Health Authorities. This main begins some three miles from the works and travels for something over two miles along a railway track used frequently every day. On the occasions on which the drips in this main have been inspected no trace of water has been found and gas has been blowing. This main was laid at a depth never more than 36 in., never more than 36 in. from the track, through several cuttings where the sub-soil is mainly boulder clay, soggy and damp. The main has at all times been satisfactory and has given no trouble.

The reinstatement of asphalt carriageway or concrete footpath is a serious matter when a length of pipe has to be replaced. This may not have to be done frequently, but immunity from such a necessity is practically assured with dried gas, provided, of course, that reasonable care is exercised in the initial laying of the pipe.

The effects of operation of a gas-drying unit are prospective and retrospective. It is possible that in low lying wet districts the gas pipes may have sunk through lack of proper support and that in these portions condensed water has collected, which water will be re-absorbed until the pipe is once again dry, when its original carrying capacity will be restored. This fact of re-absorption was borne home to us after a few months' operation of the plant when we were inundated with complaints of poor supplies. On investigation it was found that these stoppages were due to naphthalene, and since we knew that that portion of the plant was working satisfactorily we assumed that the drying out of the pipes had caused the naphthalene which had, so to speak, been held in suspension by the water to be driven forward until some restriction or diminution in the diameter of the pipe had caused it to stop the supply. Incidentally, at several points where the main was opened this naphthalene was blown forward in a snowy cloud.

Working Costs

The following figures relate to the working costs of the process, taking as the basis an average daily output of 540,000 cu.ft.:

	s.	d.
Interest on capital and depreciation, £1,000 at 12½% per annum	6	10
Calcium chloride		4
Oil, grease, &c.		4
Labour charges—say, ¾ hour per day	1	0
Steam, 3 h.p. at 50 lb. per hour, and 1s. 8d. per 1,000 lb.	6	0
Total cost ...	14	6

The cost per 1,000 cu.ft. of gas treated thus equals 0.317d.; while with the plant working at full capacity of 1,000,000 cu.ft. per day the cost would probably not exceed 0.225d.

You will observe that in this computation no reference is made to the cost of cooling water. In this connexion an ingenious method of cooling has been adopted at Kirkintilloch. It has been arranged that the tank of the mixed gas holder shall overflow through the cooling rack, passing into a small tank whence the water is pumped periodically back to the gasholder, or if this is not necessary due to particularly wet weather, pumped to an overhead tank where the water for coke quenching is stored.

DOMESTIC GAS WATER HEATING

A NEW bulletin issued by the American Gas Association gives the results of research on gas water heating for domestic purposes. It represents the culmination of studies extending over a period of nearly three years, and covers a large number of subjects relating to design, selection, and the installation of appliances of this kind.

In millions of American homes water is heated with gas appliances specifically designed for this purpose. Annually, more than three-quarters of a million water heaters are purchased by gas consumers to replace older types, or to provide for the first time in many cases the convenience and satisfaction of gas water heating service. The predominant position occupied by gas in the residential water heating field is due, in some degree, to the inherent adaptability of this fuel to supplying a superior and economical service. A second major factor has been the availability of a large variety of sizes and types of water heaters all well designed to meet widely varying hot water requirements and different classes of service. A third reason for the Industry's success in this field, and a necessary corollary to availability of suitable appliances has been the issue of technical data and training of personnel for the purpose of ensuring selection of contemporary types of heaters best adapted for the purpose involved, and to provide initially and to maintain over a long period of usage their inherently high level of performance.

When this programme of research was inaugurated it was fully appreciated that all aspects of gas water heating had benefited by the research and engineering developmental activities of manufacturers, gas companies, and various committees of the American Gas Association. It was neither intended that this project should be a substitute for these separate and independent activities, nor expected that it would discourage their continuation. In fact, it seems evident that the scope and intensity of such work has, if anything, been increased during the period covered by this investigation, and it may be that the effect of a co-operative industry project in creating generally a better understanding of the desirability and value of research constitutes one of its major advantages. The primary objective of this work was, however, to supplement research carried on by other agencies, particularly in those fields where this co-operative investigation would produce technical data susceptible of wide application, thereby serving to eliminate need for unnecessary duplication of the same work by a number of independent agencies. An important aspect of the value of this co-operative programme is that by providing basic technical data to the entire Industry not only can unnecessary duplication of effort be avoided, but the facilities and resources of separate companies can be freed for concentration on product development and other specific applications of the data.

Essential data are briefly summarized below.

Heat Losses from External Surfaces of Automatic Storage Water Heaters

Of the numerous types of insulating materials commonly employed on automatic storage type water heaters their effectiveness was found to be as follows, in the order presented: (1) Siliceous wool (rock wool and mineral wool), glass wool; (2) exploded mica (medium particle size), laminated asbestos (8 plies per in.); (3) exploded mica (course and fine particle sizes), corrugated asbestos (4 plies per in.); (4) metal foil on corrugated paper on inside of jacket with air space between storage vessel and foil, metal foil on jacket with air space between storage vessel and foil.

Correlating results of this investigation with published heat transmission coefficients, it is indicated that available materials may be classified from the standpoint of insulating effectiveness as follows:

(1) Materials having heat transmission factors of 0.27 B.Th.U./hr./°F./in. of thickness per sq. ft. or lower, produced best results.
(2) Insulations having heat transfer coefficients ranging from 0.27 to 0.32 B.Th.U./hr./°F./in. of thickness per sq. ft. or lower, produced somewhat less satisfactory results than the materials indicated in (1).
(3) Materials having heat transfer coefficients greater than 0.32 gave appreciably lower service efficiencies than insulating materials indicated in preceding items (1) and (2) when used in the same thickness.

It was found that effectiveness of all loose types of insulating material varied considerably when employed at different apparent densities. Best densities for various materials from the standpoint of insulating effectiveness were as follows: (1) Long fibre siliceous wool, 9 to 10 lb. per cu.ft.; (2) medium fibre siliceous wool, 9 to 10 lb. per cu.ft.; (3) short fibre siliceous wool, 9 to 10 lb. per cu.ft.; (4) glass wool, 2½ to 3 lb. per cu.ft.; (5) exploded mica, 6½ to 7.7 lb. per cu.ft.

Loose materials had a tendency to settle when tested under conditions simulating handling as in shipment or installation. Such settling was found to increase as the height of the column (i.e. heater height) was increased, and with decreasing densities for fibrous materials. Settling of insulating materials was not affected by the thickness of the column.

For certain types of siliceous wool, densities required to prevent settling were higher than densities for optimum insulating effectiveness. Settling of fibrous materials studied during this investigation was eliminated when packed in heaters 40 in. high at the following densities: (1) Long fibre siliceous wool, 11 to 11¼ lb. per cu.ft.; (2) medium fibre siliceous wool, 9 lb. per cu.ft.; (3) short fibre siliceous wool, 18 to 18½ lb. per cu.ft.; (4) glass wool, 2.5 to 3.0 lb. per cu.ft.

For granular material such as exploded mica, settling was found to be a function of particle size, minimum settling being obtained with larger particle sizes.

It was determined that settling resulting from handling and shipment of heaters can be closely simulated by suitable laboratory tests. Dropping a heater or test chamber through a distance of ½ in. 50 times will bring about settling comparable to that produced by shipping or installation of heaters.

Heat loss from storage vessels does not decrease in the same proportion as increase in thickness of insulation. For example, heat losses from a bare tank were decreased 56.5% by addition of a ¼ in. thickness of siliceous wool insulation. Increasing the thickness of insulation by 2.66 times from ¼ to 2¼ in. brought about a further decrease in heat loss of 41%.

Loss of Heat Through Piping and Heat Traps Attached to Water Heaters

For a given diameter of pipe or tubing, an increase in length of piping attached to a heater was found to increase its stand-by loss and to decrease its service efficiency, both of these effects being more pronounced for larger pipe sizes.

Stand-by losses of a heater increased at a relatively rapid rate as the first few feet of piping were attached and at a progressively

decreasing rate as length of piping was further increased. For example, with 12 ft. of ½ in. pipe attached to a heater, its stand-by loss was increased by 1,240 B.Th.U. per day, whereas with a length of 50 ft. (320% increase in length) of the same diameter pipe attached, its stand-by loss was increased by 2,105 B.Th.U. per day, or only about 70% greater than with 12 ft. of piping.

Service efficiencies decreased in nearly linear proportion to increase in piping length. For the corresponding test conditions described in preceding item, service efficiencies decreased with 12 ft. of pipe, an equivalent of 3,400 B.Th.U. per day and with 50 ft. of pipe about 12,000 B.Th.U. per day.

Heat losses from piping as evidenced by service efficiency tests became greater as the frequency of usage was increased for the same total daily draw of hot water in gallons.

The rate of cooling of hot water left in piping after a draw increased as the size of piping was decreased, this characteristic being a function of the ratio of pipe surface area to its volume per lineal ft. and being independent of the material of which the piping was fabricated.

The rate at which water was drawn in gallons per minute greatly affected heat losses from piping for the same total daily draw of hot water. As the rate of draw was decreased, heat losses from piping increased and service efficiencies decreased.

Heat losses from piping increased and service efficiencies decreased as the size of piping was increased when the rate of flow in gallons per minute was the same for each size of piping or tubing.

Where a decrease in size of piping produced a drastic decrease in flow capacity, service efficiencies were in some cases lower with the smaller than with the larger pipe sizes.

Variation in thermal conductivity of different materials of which piping is constructed was found not to have any important effect on service efficiencies for similar conditions of piping length and diameter, rate of draw, and total daily draw.

Heat traps were found not to affect appreciably heat losses from piping.

Insulation of heat traps destroyed entirely what little effectiveness they had when non-insulated.

Stand-By Losses of Water Heaters

Variations in pilot input rate did not have any appreciable effect on percentage stand-by losses provided the maximum input rates employed did not result in deposition of carbon or produce incomplete combustion.

When pilot input rates were increased to a point causing the temperature of stored water to creep above the thermostatic setting, the total heat input required to compensate for stand-by losses at the resultant higher stored water temperature increased; but percentage stand-by loss did not change materially since heat content of the stored water varied nearly directly with total heat input.

Reduction of circulation of air through heater flues during stand-by periods as by use of automatic flue or secondary air dampers was found to be effective in reducing stand-by losses.

(1) Results indicated that effectiveness of such control was greater where excess air concentrations were higher as evidenced by comparative data on two heaters having the same input rate and storage vessel capacity; on one heater having 45% excess air at normal input rate, stand-by loss was decreased about 10% by automatic flue control, whereas on the other having 112% excess air, stand-by loss was decreased by approximately 40%.

(2) Reduction of circulating air during stand-by periods was also beneficial in increasing service efficiencies, increases of about 4 and 18% being found on the two heaters indicated in preceding item (1) for a daily delivery of 60 gal. of hot water.

On automatic storage heaters of comparable size and designed to produce the same excess air in the flue gases, stand-by losses were found to be lower as the main burner input rate was decreased.

Total daily gas consumptions required to compensate for heat losses during stand-by decreased in nearly linear proportion to decrease in stored water temperature. Stand-by losses, when expressed as a percentage of the stored heat content, did not change significantly as the temperature of stored water was varied within practical limits.

Service efficiencies were found not to change appreciably with practical variations in stored water temperature provided the same volume of water or the same quantity of heat were drawn in each case. When the same volume of water was drawn at different stored water temperatures, total gas consumptions increased as stored water temperature was increased, whereas when the same quantity of heat was drawn under variable conditions of stored water temperature total gas consumptions remained substantially constant as did service efficiencies.

In general, heat losses from conventional cylindrical type storage vessels having similar proportions varied as the cube root of the storage vessel capacity.

Combustion Chambers and Flueways

For typical designs of underfired storage type heaters the volume of excess air required in the flue gases at the normal input rate and which would be sufficient for complete combustion at 1.5 normal gas pressure or 22½% increase in gas input are equivalent to:

(1) 75% for adequate flexibility in performance of present-day heaters.

(2) 50% where all secondary air is directed into the combustion zone near the base of the flame.

(3) 25% as a theoretical minimum.

An increase in amount of excess air in the flue gases generally caused a decrease in service efficiency, this effect being less pronounced when the ratio of area of heating surfaces to input rate was high, as in the case of external flue or slow recovery internal flue heaters.

Total area of openings in a combustion chamber required for admission of suitable quantities of secondary air into the combustion chamber was affected by input rate, percentage of excess air in the flue gases, primary air injection, baffling, &c.

Minimum distance from burner ports up to nearest surface required to eliminate impingement was found to vary with primary air injection, secondary aeration, input rate per square inch of port area, &c.

Heat transfer through bottoms of storage vessels was found to depend on many variables such as shape of bottom, lateral location of burner in respect to flue inlet, aeration, and baffling. However, it was indicated that a satisfactory basis for flue design problems was the ratio of input rate to available heating surface area of the storage vessel bottom.

It was found that flues of underfired internal or external flue type automatic storage heaters could be designed in accordance with equations empirically developed from the data obtained in this investigation so as to produce high thermal efficiencies and satisfactory combustion for any predetermined input rate and storage vessel size.

Finned heating surfaces were found to increase the total heat transferred. However, the rate of heat transfer per unit of heating surface area was less for finned surfaces than for the water-backed flue wall to which the fins were attached. Heat transfer effectiveness of the No. 20 U.S. Std. Ga. sheet steel fins employed in this investigation decreased as their length measured outwardly from the flue wall increased.

Service Efficiency of Automatic Storage Heaters

It was found that service efficiencies of automatic storage water heaters could be calculated from thermal efficiency and stand-by loss data by use of the following equation:

$$E_s = \frac{883\ t_1\ G}{\frac{833\ t_1\ G}{e_{tt}} + \left(24 \frac{833\ t_1\ G}{q e_{tt}}\right) 0{\cdot}0833\ t_2\ VS}$$

Where:

E_s = service efficiency, %
t_1 = difference between outlet and inlet water temperature, °F
G = quantity of hot water drawn, gal./day
e_{tt} = thermal efficiency of heater, %
q = input rate, BTh.U./hr
t_2 = difference between average stored water temperature and room temperature, °F
V = storage vessel capacity, U.S. gallons and
S = stand-by loss of heater, %/hr

Comparison of results of calculated service efficiencies by use of the equation in preceding item and of actual draw-off service efficiency tests on corresponding heaters indicated that reasonably close agreement existed when thermal efficiency values employed in the equation were determined from thermal efficiency tests made with a cold start.

Frequency and amounts of individual draws did not affect service efficiency results obtained for a heater provided the same total quantity of water was drawn in each case.

For any heater, service efficiencies increased as the quantity of water drawn daily was increased, the magnitude of variation ranging from a service efficiency of zero when no water was drawn to a service efficiency equivalent to approximately the thermal efficiency of the heater when a quantity of water equal to its recovery capacity was drawn.

Service efficiencies were found to increase as:

(1) Input rates were decreased, this effect being more pronounced for heaters with high stand-by losses and for relatively low daily draws of hot water.

(2) Storage vessel capacities were decreased, the effect of variations in storage vessel capacity being greater as input rate and stand-by losses were increased and as the quantities of water drawn daily were decreased.

(3) Stand-by losses were decreased, this variable exerting a more pronounced effect as the quantity of water drawn daily was decreased and storage vessel sizes were increased.

(4) Thermal efficiencies were increased, a given change in thermal efficiency having a greater influence when quantity of water drawn daily was increased and stand-by losses and storage vessel sizes were decreased.

It was determined that for any given condition of hot water usage, heaters having just sufficient capacity to supply this predetermined demand operated with higher service efficiencies than heaters having a higher input rate or a larger storage vessel capacity. For a predetermined quantity of hot water to be delivered daily, the input rate or storage vessel capacity (or both) of such minimum capacity heaters must be increased as the hourly demand is increased.

Service efficiencies with which a predetermined condition and quantity of hot water usage can be produced by minimum capacity heaters varied, depending on the ratio of input rate to storage vessel size. Differences in service efficiencies for such cases were found to be as much as 25%.

Trade News

Ventilation in the Black-out

The Gas Industry is second to none in its recognition of the difficulties in providing adequate ventilation which have arisen from essential adherence to the strict black-out regulations, and has therefore welcomed the solution of the problem provided by Colt Ventilation, Ltd., Bush House, London, W.C.2, in its Colt Black-out Ventilator, covered by provisional patents. The essential points of the ventilator are unrestricted air flow, complete obscuration of light, unobtrusiveness, simplicity of construction, absence of moving parts, weather resistance, low cost, easy fixing, and the fact that it requires no attention when in use. It is designed to admit air freely into or out of a room or building without at the same time allowing the passage of light in either direction, and consists of a rectangular surrounding frame, from side to side of which are fixed a number of horizontal louvres, each consisting of lead-coated sheet metal or fibre $1\frac{7}{8}$ in. wide, bent longitudinally into an angle of about 140°, forming a vertical face 1 in. wide and a sloping face $\frac{7}{8}$ in. wide.

The louvres are disposed alternately on opposite sides of the frame and arranged in a series, at about 2 in. centres from top to bottom of each side of the frame in such a way that the projecting sloping arm of the element projects inwardly into the interior angle of the corresponding member on the opposite side in a continuous series from top to bottom of the frame. The surfaces are coated with a special heavy black matt weather-resisting paint so that all the surfaces are as nearly dead black as possible. Exhaustive wind-tunnel tests have been carried out, together with practical tests under working conditions in factories, offices, and buildings of various types. These tests have not only demonstrated the efficiency of the ventilator but have provided valuable data regarding the area of ventilators required to ventilate various types of rooms and buildings. Experiments show the ventilator to be so efficient that the number and size required to give adequate changes of air in any given condition is remarkably small.

Home Safes for Gas Bills

Systematic saving has become a national habit, and the principle of putting away a fixed sum week by week is being extended far beyond the sphere of providing for a rainy day. Public utility undertakings are encouraging those of their consumers who do not use prepayment meters to set aside a sufficient amount each week to meet their quarterly liabilities without financial embarrassment when they become due, and many of them have introduced home safes similar to those employed by the Post Office Savings Bank and other thrift institutions. A booklet from the Automatic Recording Safe Company, Ltd., 83, Ridgemount Gardens, London, W.C.1, illustrates and describes a variety of such safes and indicates how they are being used for accumulating the means for meeting quarterly lighting, heating, and cooking accounts. A typical arrangement is for the undertaking to issue a home safe, the key of which is held by the undertaking, without charge beyond a small returnable deposit, and to notify the consumer that his average consumption, meter rental, hire purchase or simple hire charges, &c., amount to, say £3 5s. per quarter, and that it will therefore be necessary for him to put into the box a weekly sum of, say, 5s. The box is opened only by the collector or cashier in the presence of the consumer and any balance is either returned to the consumer or placed in the box to go towards the next account. Wherever the system has been adopted it has proved a great success in facilitating the collection of accounts.

"Foochow" Splinter-proof Compound

A new product just placed on the market by Messrs. Donald Macpherson & Co., Ltd., is claimed to render glass less vulnerable to high-explosive blast. "Foochow" splinter-proof compound is applied by simple brushing or spraying and dries completely transparent in eight hours. One gallon will cover (with one coat) 65 sq. yds.; but two coats are recommended for general purposes. It is applicable to all types of glass and is of a permanent nature; it can, however, be effectively removed by means of "Foochow" stripper. On factory and office windows, as distinct from shop windows, greatly improved reinforcement can be obtained by sandwiching a layer of mutton cloth or other thin, cheap fabric or strong thin paper between the two coats of compound.

Ample Supplies of Lead Goods

The Non-Ferrous Metal Control has informed Associated Lead Manufacturers, Ltd., Newcastle-on-Tyne, that licences are being granted freely for pig lead for the manufacture of white lead, red lead, sheet and pipe, &c., but that supplies of copper and zinc (spelter) are severely restricted excepting for the manufacture of products for service and export requirements. It is therefore clear that there are ample supplies of lead, and manufactured lead goods of all descriptions are available for prompt delivery. Merchants' stocks can be sold without licence and all lead products are available for the manufacturers. Wherever possible information should be given with the order as to the use to which the materials are to be put in order to assist the manufacturers to maintain adequate labour and to obtain licences for their raw materials, packages, &c. No difficulty should be experienced in regard to supplies of lead goods, but if any difficulties should arise, enquirers are invited to communicate with Associated Lead Manufacturers, Ltd.

Gas Products Prices

The London Market

July 1.

There are no changes to record in the values of Tar Products in the London market, which remain as under: Pitch, about 50s. per ton f.o.b.; creosote, about 4¼d. to 5d. per gallon; refined tar 3¾d. to 4d. per gallon; the price of pure toluole under the Ministry of Supply Order is just under 2s. 5d. per gallon; pure benzole, 1s. 10d.; 95/160 solvent naphtha, 1s. 11d. to 2s.; and 90/160 pyridine, about 18s. 6d., all per gallon naked; refined naphthalene crystals, £23 per ton in bags, all *ex* makers' works.

The Provinces

July 1.

Crude Gas-Works tar, 27s. 3d. to 32s. 3d.

To avoid misunderstanding, it is necessary to state that the above price is not claimed to represent a market value. It is a price worked out from week to week upon a system which has been used for many years as a basis for the fixing of certain contracts for crude tar of varying qualities in different areas.

The average prices of gas-works products during the week were: Pitch.* Toluole, naked, North, 1s. 9½d. (Controlled by the Ministry of Supply Order No. 1, which fixes the maximum price at which this material may be sold). Coal tar, crude naphtha, in bulk, North, 9d. to 9¼d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 9d. Heavy naphtha, North, 1s. 4½d. to 1s. 5½d. Creosote, *ex* works, in bulk, North, liquid and salty, 4¼d. to 4¾d.; Scotland, 4¼d. to 4¾d.; low gravity, 4½d. to 4¾d. Fuel Grade, 4d. to 4¼d. Carbolic acid, 60's. 3s. 6d. to 3s. 7½d. Naphthalene, £15 to £20. Salts, 75s. to 85s., bags included. Anthracene, "A" quality, 4½d. to 4¾d. per minimum 40% purely nominal. Heavy oil: Unfiltered anthracene oil, (min. gr. 1,080), 5¼d. to 5½d.; filtered heavy oil (min. gr. 1,080), 5¾d. to 6d.; heavy anthracene oil gr. less than 1,080, 6d. to 6¼d.

* Pitch.—Owing to the Export Trade being at a standstill due to the position in France it is practically impossible at the moment to quote a market price for pitch.

Scotland

GLASGOW, June 29.

Trading is rather quiet but prices of most products are being maintained at previous levels.

Crude gas-works tar.—The actual value is about 42s. 6d. to 45s. per ton *ex* works in bulk.

Pitch of vertical quality is called 40s. per ton f.o.b. for export and 37s. 6d. per ton *ex* works in bulk for home trade.

Refined tar.—In the home market there is a small but regular business at 4¼d. to 4½d. per gallon, while for export quoted price is 3½d. per gallon, both f.o.r. naked.

Creosote oil.—Supplies are quite plentiful and prices are steady as under: Specification oil, 5¼d. to 5¾d. per gallon; low gravity, 6½d. to 7d. per gallon; neutral oil, 6d. to 6½d. per gallon; all *ex* works in bulk.

Cresylic acid.—This is still a dull feature and prices continue easy as follows: Pale, 97/99%, 2s. 1d. to 2s. 2d. per gallon; dark, 97/99%, 1s. 10d. to 1s. 11d. per gallon; pale, 99/100%, 2s. 6d. to 2s. 8d. per gallon; all *ex* works in buyers' packages.

Crude naphtha commands 6½d. to 7½d. per gallon *ex* works in bulk, according to quality.

Solvent naphtha.—90/160 grade is 1s. 8½d. to 1s. 9½d. per gallon and 90/190 heavy naphtha is 1s. 4½d. to 1s. 5½d. per gallon.

Motor benzole is 1s. 8d. to 1s. 8½d. per gallon.

Pyridine.—Prices are nominal at 18s. to 19s. per gallon for 90/160 grade and 20s. to 21s. per gallon for 90/140 grade.

Trading Results

Whessoe Foundry and Engineering Co., Ltd.

The works production of the Whessoe Foundry and Engineering Co., Ltd., constituted a record, stated Mr. Harold G. Judd, C.B.E., presiding at the 20th annual general meeting of the firm. The present year marks the completion of 150 years since the inception of the business in 1790, and 20 years since the formation of the present Company. The completion of the new welding shop, itself of welded construction, coupled with the installation of additional plant of the latest type, has put the works in a condition of the highest efficiency. The firm have continued to supply important plants for the cleaning and treatment of blast furnace, coal, and producer gas, and have thus made a valuable contribution to the more efficient utilization of the country's fuel resources. The balance sheet displays a very healthy condition. Profits are rather lower than those of the previous year. About one-half of the profit has been appropriated to meet taxation. By way of celebrating the 150th anniversary of the business, a donation of £500 has been made to the Darlington Hospital, which serves so many of the Company's employees in time of illness. The directors' report and accounts were adopted, including the declaration of a dividend of 40%.

Keith Blackman, Ltd.

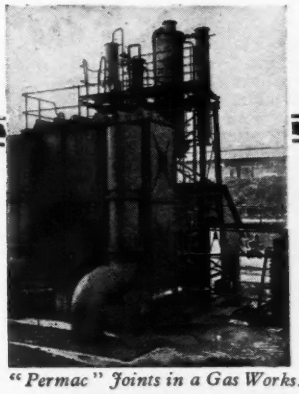
Presiding at the annual meeting of Keith Blackman, Ltd., on June 27, Mr. G. Keith said the output for the year ended March 31 was the highest in the Company's history, and in spite of heavy expenses arising out of war conditions the Directors were able to recommend a dividend at the same rate as last year—namely, 15%. A steady increase in turnover in the five months before the war was followed by a rapid rise in the first seven months of the war, mostly related to war work. While the net profit at £32,770 was only £242 more than for the previous year, an additional £8,800 had been reserved for tax liability, and £17,637 had been written off out of profits for civil defence requirements. Apart from these two special items the cost of fuel, light, and power had risen disproportionately under continuous black-out conditions. Taking these factors into consideration the results of the year's working could be considered satisfactory. Mr. C. Tuson was re-elected a Director, and a hearty vote of thanks to the staff and workmen was passed on the proposition of Mr. J. W. Hampsheir.

Greenwood & Batley, Ltd.—The Directors' report shows a profit of £83,390, against £105,466 for the previous year, after taxation £44,892 (£19,000). Depreciation was £31,125 (£37,500), and the final dividend is 10%, making 13% for the year, against 15% for the previous year.

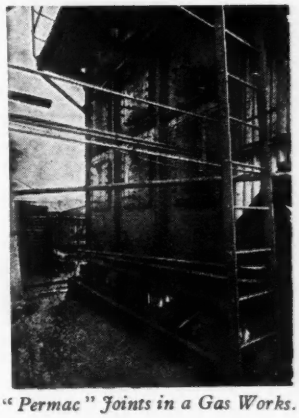
Allied Ironfounders, Ltd.—The profit for the past year was £112,424, against £198,428 for the previous year, and the final dividend is 2½%, making 5%, against 9% last year. The carry-forward is £178,197 (£160,918), after centralization, obsolescence and depreciation reserve of £20,000 and contingency reserve of £15,000. The total trading profits of the subsidiaries and sub-subsidiaries, after proportion of A.R.P. expenditure, was £216,875 (£292,937). The amount taken from the year's profit for income tax was £104,423 (£84,221) and for National Defence Contribution £10,273 (£15,035).

Contract Advertised

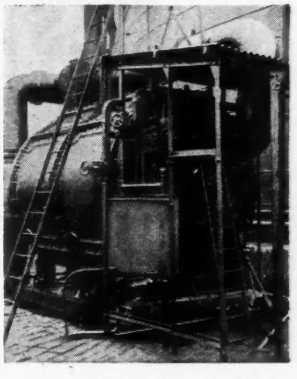
Carburetted Water Gas Plant.
Ossett Gas Dept. [p. 46].



"Permac" Joints in a Gas Works.



"Permac" Joints in a Gas Works.



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GAS STOCKS AND SHARES

For the greater part of last week the volume of business on the Stock Exchange was almost negligible and prices pursued a downward course. Tuesday saw the opening of the National War Bond issue, the immediate response to which was substantial, and this counter attraction apart from any outside influences affected the demand in other sections. A rally set in later, however, and under the influence of a modest buying movement prices of leading industrials recorded sharp rises. British Funds maintained a steady undertone although a few showed fractional declines—2½% Consols closed at 71 against 71½ a week ago. It would appear that for the time being at any rate the collapse of prices due to the fall of France has been stemmed, and if only a moderate amount of buying can be maintained the present recovery should continue.

Business in the Gas Market was practically at a standstill throughout the entire week, and in the absence of support a large number of stocks reacted still further. Most of the falls occurred among the fixed-interest issues, although the few "ordinaries" affected were the hardest hit. Cardiff Consolidated, for instance, closed 10½ points down at 95, the stock changing hands at 96. Bournemouth 7%, Plymouth and Stonehouse, and South Eastern Gas Corporation all dropped 5½ points, while British, Imperial Continental, Oriental and Severn Valley each lost 5 points. For the first time for some weeks past Gas Light units closed the week unchanged. A surprise occurred on the Provincial Exchange where an actual rise in price occurred, Hartlepool gaining 3½ points to 66½ after support. Bristol reacted another 2½ points to 90.

That only forced sales are coming into the market is evidenced by the fact that parcels of stock on offer appear week after week in the lists of those available and are not taken up. Many of our usual investors are doubtless now lending their money to the Government and rightly so.

Official Quotations on the London Stock Exchange

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
1,767,439	Mch. 11	8	7	Alliance & Dublin Ord. ...	110—115	...
374,000	Dec. 27	4	4	Do. 4 p.c. Deb. ...	80—90	...
957,608	May 13	5	5	Ascd. Gas & Water U'd'ts Ord.	13/6—15/6	—/6
500,000	"	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	15/6—17/6	...
535,545	"	4	4	Do. 4 p.c. Red. Cum. Pref.	14/6—16/6	...
336,646	"	4	4	Do. 4 p.c. Irred. Cum. Pref.	13/—15/—	...
750,000	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	82—87	...
£60,070	Feb. 19	7	7	Barnet Ord. 7 p.c.	122—127	...
300,000	Apl. 8	1/4⅜	1/9⅜	Bombay, Ltd.	19/6—21/6	...
181,915	Feb. 26	9¼	9¼	Bournemouth Sliding Scale ...	145—150	...
690,526	"	7	7	Do. 7 p.c. max. ...	110—120	—5½
493,960	"	6	6	Do. 6 p.c. Pref. ...	115—120	—1
50,000	June 17	3	3	Do. 3 p.c. Deb. ...	65—70	—3
362,025	"	4	4	Do. 4 p.c. Deb. ...	90—95	—3
335,000	"	5	5	Do. 5 p.c. Deb. ...	97—102	—3
357,900	Feb. 19	7½	6¾	Brighton, &c., 6 p.c. Con. ...	103—108	...
659,955	"	6¾	5⅞	Do. 5 p.c. Con. ...	98—103	...
205,500	"	6	6	Do. 6 p.c. 'B' Pref. ...	103—108	...
855,000	Mch. 11	7	8	British Ord.	85—95	—5
100,000	June 17	7	7	Do. 7 p.c. Pref.	118—123	...
350,000	"	5½	5½	Do. 5½ p.c. 'B' Cum. Pref.	110—115	...
120,000	"	4	4	Do. 4 p.c. Red. Deb.	75—80	...
450,000	"	5	5	Do. 5 p.c. Red. Deb. ..	93—98	...
100,000	22 May '33	6	4	Cape Town, Ltd.	¼—¾	...
100,000	6 Nov. '33	4½	4½	Do. 4½ p.c. Pref.	¼—¾	...
150,000	June 17	4½	4½	Do. 4½ p.c. Deb.	52—57	...
626,860	Jan. 29	6	5⅞	Cardiff Con. Ord.	90—100	—10½
237,860	June 17	5	5	Do. 5 p.c. Red. Deb. ...	95—100	...
98,936	Apl. 8	2/-	2/-	Colombo Ord.	1½—1¾	...
24,510	"	1/4⅜	1/4⅜	Do. 7 p.c. Pref.	19/6—21/6	...
739,453	Mch. 26	-/11.48	-/11.48	Colonial Gas Assn. Ltd. Ord. ...	14/6—16/6	...
296,144	"	1/3.30	1/3.30	Do. 8 p.c. Pref.	20/—22/—	...
1,775,005	Jan. 29	4	2	Commercial Ord.	40—50	—2½
140,000	Feb. 19	4	4	Do. 4 p.c. Red. Pref. ...	87—92	...
620,000	June 10	3	3	Do. 3 p.c. Deb.	58—63	—3
286,344	Feb. 19	5	5	Do. 5 p.c. Deb.	95—100	—2
200,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	93—98	...
807,560	Feb. 12	7	7	Croydon sliding scale	90—100	...
644,590	"	5	5	Do. max. div.	85—90	...
620,385	Dec. 7	5	5	Do. 5 p.c. Deb.	95—100	—3
208,660	Feb. 19	5	5	Dudley, Brierley Hill & Dist. Ord.	98—103	...
82,275	"	5	5	Do. 5 p.c. Con. Pref. ...	93—98	...
79,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	95—100	...
239,000	Jan. 29	5	88/6	East Hull Ord. 5 p.c.	70—80	...
187,215	Feb. 12	5½	5½	East Surrey Ord. 5 p.c. ...	93—98	...
176,211	June 17	5	5	Do. 5 p.c. Deb. ...	95—100	—2
250,000	Nov. 13	8	4	Gas Consolidation Ord. 'B' ...	15/—17/—	...
250,000	May 13	4	4	Do. 4 p.c. Red. Cum. Pref.	15/—17/—	...
19,152,410	Jan. 29	5§	3§	Gas Light & Coke Ord. ...	11/6—12/6a	...
2,600,000	"	3½	3½	Do. 3½ p.c. max.	55—60	...
4,477,106	"	4	4	Do. 4 p.c. Con. Pref. ...	80—85	—2
2,993,000	Jan. 2	3§	3§	Do. 3§ p.c. Red. Pref. ...	80—85	—3
8,602,497	June 3	3	3	Do. 3 p.c. Con. Deb. ...	61—66	—2
3,642,770	"	5	5	Do. 5 p.c. Red. Deb. ...	99—104	—1
3,500,000	"	4½	4½	Do. 4½ p.c. Red. Deb. ...	95—100	...
700,000	Mch. 11	3½	3½	Do. 3½ p.c. Red. Ded. ...	80—85	—5
270,466	Feb. 19	6	6	Harrogate New Cons.	93—98	...
157,500	Apl. 8	‡1/-	‡1/-	Hong Kong and China Ord. ...	¼—¾	...
5,600,000	May 13	4	8	Imperial Continental Cap. ...	35—45	—5
172,810	Jan. 29	3½	3½	Do. 3½ p.c. Red. Deb. ...	70—75	...
63,480	June 24	3	3	Maidstone 3 p.c. Deb.	54—59*	—1
45,000	June 10	†8	†10	Malta & Mediterranean ...	88—98	...
				Metropolitan (of Melbourne) ...		
392,000	Apl. 1	5½	5½	5½ p.c. Red. Deb.	95—100	...
231,977	Feb. 19	5	5	M.S. Utility 'C' Cons.	77—82	...
968,658	"	4	4	Do. 4 p.c. Cons. Pref. ...	80—85	—2
390,076	June 24	4	4	Do. 4 p.c. Deb. ...	85—90*	—2

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
148,955	June 24	5	5	M.S. Utility 5 p.c. Deb. ...	95—100*	—8
125,000	Jan. 2	3½	3½	Do. 3½ p.c. Red. Bds. ...	90—95	...
675,000	May 6	†4	†4	Montevideo, Ltd.	58—63	...
250,000	Mch. 18	7½	5 7/10	North Middlesex 6 p.c. Con. ...	103—108	.
396,160	Jan. 29	5	5	Northampton 5 p.c. max. ...	97—102	...
300,000	Apl. 29	9	7	Oriental, Ltd.	108—113	—5
468,537	June 3	7	8	Plymouth & Stonehouse 5 p.c.	105—115	—5½
621,667	Feb. 5	8½	8½	Portsmouth & Gosport Cons.	105—110	...
241,446	"	5	5	Do. 5 p.c. max.	82—87	...
73,350	"	5	5	Do. 5 p.c. Pref.	88—93	...
75,000	"	4	4	Do. 4 p.c. Pref.	75—80	...
114,000	Feb. 5	5	5	Preston 5 p.c. Pref.	88—93	...
247,966	June 17	4	4	Primitiva 4 p.c. Cons. Deb. ...	91—96	...
625,959	Jan. 15	4	4	Do. 4 p.c. Red. Deb. ...	91—96	...
15,000	Mch. 11	6	6	San Paulo 6 p.c. Cum. Pref. ...	4½—6½	...
441,275	Apl. 29	1/1½	1/1½	Severn Val. Gas Cor. Ld. Ord.	15/6—17/6	—1/—
460,810	Mch. 11	—/10⅝	—/10⅝	" " 4½ p.c. Cum. Pref. ...	16/6—18/6	...
133,201	Feb. 12	8½	5	Shrewsbury 5 p.c. Ord. ...	105—115	...
9,000	June 17	†4	†5	South African Ord.	3½—4½*	...
1,996,297	Apl. 29	1/2⅜	1/	South East'n Gas Cn. Ld. Ord.	11/—13/—	—1/6
1,000,000	Mch. 4	—/10⅝	—/10⅝	Do. 4½ p.c. Red. Cum. Pref.	14/—16/—	...
769,191	"	4	4	Do. 4 p.c. Cum. Pref. ...	13/—15/—	...
450,000	Feb. 12	4	4	Do. 4 p.c. Red. Deb. ...	95-100	...
150,000	"	3½	3½	Do. 3½ p.c. Red. Deb. ...	89—94	...
6,709,895	"	5	4	South Met. Ord.	35—45	—3
1,135,812	"	6	6	Do. 6 p.c. Irred. Pref. ...	109—114	...
850,000	"	4	4	Do. 4 p.c. Irred. Pref. ...	80—85	—2
1,895,445	Dec. 27	3	3	Do. 3 p.c. Deb.	61—66	—2
1,000,000	Jan. 15	5	5	Do. 5 p.c. Red. Deb. ...	97—102	—1
600,000	"	3§	3§	Do. 3§ p.c. Red. Deb. ...	92—97	...
1,543,795	Feb. 5	6	3	South Suburban Ord. 5 p.c. ...	70—75	...
512,925	"	5	5	Do. 5 p.c. Pref.	90—95	...
500,000	"	4	4	Do. 4 p.c. Pref.	73—78	—5
250,000	"	3§	3§	Do. 3§ p.c. Red. Pref. ...	82—87	—3
888,587	June 10	5	5	Do. 5 p.c. Deb.	95—100	—3
250,000	"	4	4	Do. 4 p.c. Deb.	85—90	...
200,000	Feb. 12	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92	...
427,859	Apl. 15	-/9⅜	1/2⅜	S. Western Gas & Water Ord.	13/—15/—	...
160,523	"	—/10⅝	—/10⅝	Do. 4½ p.c. Red. Cum. Pref.	15/—17/—	...
110,000	June 17	4	4	Do. 4 p.c. Red. Deb. ...	85—90	...
750,541	Feb. 5	5	5½	Southampton Ord. 5 p.c. ...	73—78	...
148,836	June 17	4	4	Do. 4 p.c. Deb.	82—87	...
350,000	Feb. 12	5½	5½	Swansea 5½ p.c. Red. Pref. ...	97—102	...
200,000	June 24	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—95*	—5
1,076,490	Feb. 26	6½	5	Tottenham and District Ord....	87—92	...
409,835	"	5½	5½	Do. 5½ p.c. Pref.	100—105	...
62,235	"	5	5	Do. 5 p.c. Pref.	92—97	...
453,380	June 10	4	4	Do. 4 p.c. Deb.	85—90	...
1,247,505	May 20	4	6	U. Kingdom Gas Cor. Ord. ...	13-/—15/—	...
1,085,952	May 13	4½	4½	Do. 4½ p.c. 1st Cum. Pref. ...	14/—16/—	...
772,709	"	4	4	Do. 4 p.c. 1st Red. Cum. Pf.	14/—16/—	...
745,263	June 17	4½	4½	Do. 4½ p.c. 2nd Non-Cum. Pf.	12/6—14/6	...
1,093,656	Mch. 18	3½	3½	Do. 3½ p.c. Red. Deb. ...	83—88	...
378,106	Mch. 11	7	7	Uxbridge, &c., 5 p.c.	95—100	...
133,010	"	5	5	Do. 5 p.c. Pref.	95—100	...
1,371,138	Feb. 5	6½	3½	Wandsworth Consolidated ...	68—73	...
2,525,768	"	4	4	Do. 4 p.c. Pref.	73—78	...
1,343,964	June 17	5	5	Do. 5 p.c. Deb.	95—100	...
383,745	"	4	4	Do. 4 p.c. Deb.	85—90	...
400,000	"	3§	3§	Do. 3§ p.c. Red. Deb. ...	87—92	...
558,342	Jan. 29	6§	6	Watford and St. Albans Ord. ...	95—100	...
200,000	"	5	5	Do. 5 p.c. Pref.	93—98	...
200,000	"	5½	5½	Do. 5½ p.c. Pref.	100—105	...
200,000	"	4	4	Do. 4 p.c. Rd. Pf. (1973/8)	85—90	...
100,000	"	33/4§	4	Do. 4 p.c. Red. Pf. (1959)	93—98	...
200,000	June 10	3½	3½	Do. 3½ p.c. Red. Deb. ...	85—90	...

a.—The quotation is per £1 of Stock. * Ex. Div. † Paid free of income-tax. ‡ For year. § Actual.

Supplementary List and Provincial Exchanges overleaf.

STOCK AND SHARE LIST—Contd.

Supplementary List, not Officially Quoted, London

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Nominal Quotations June 28.	Rise or Fall on Week.
202,152	Mch. 18	5	5	Ascot Ord.	80—85	...
128,182	Dec. 27	5	5	Do. 5 p.c. Pref. ...	88—93	...
31,035	Mch. 4	-/9⅜	-/9⅜	Associated Utilities 4 p.c. Pref.	15/—17/-	...
100,000	June 24	3½	3½	Do. 3½ p.c. Red. Deb. ...	87—92*	-3
17,000	Feb. 19	8	8	Bognor Orig. Ord. 'A' ...	102—112	...
62,210	,,	8	8	Do. New Add. 'A' ...	102—112	...
87,160	,,	7	7	Do. New 7 p.c. max. ...	95—105	...
37,440	Jan. 29	10	10	Cam. Univ. & Town 10 p.c. max.	145—155	...
125,970	,,	7	7	Do. 7 p.c. max.	100—110	...
39,025	,,	5	5	Do. 5 p.c. max.	80—90	...
96,410	Jan. 29	4½	4½	Cardiff 4½ p.c. Pref.	90—95	...
55,520	Feb. 19	6	6	Colchester 6 p.c. Pref.	100—105	...
90,550	Mch. 18	5	5	Do. 5 p.c. Deb. ...	95—100	-3
150,000	Feb. 12	4	4	Croydon 4 p.c. Pref.	82—87	...
130,000	Dec. 27	4	4	Do. 4 p.c. Deb.	85—90	-2
65,000	Mch. 4	7⅛	6⅞	Eastbourne 'A' 5 p.c.	100—105	...
198,000	,,	6	5⅝	Do. 'B' 3½ p.c.	83—88	...
112,312	,,	5	5	Do. 5 p.c. Pref.	90—95	...
130,000	June 24	5	5	Do. 5 p.c. Deb.	95—100*	-3
130,500	Feb. 19	7½	7½	Exeter New Ord. (£10) ...	12—14	...
24,000	Aug. 21	8½	8½	Gt. Yarmouth 8½ p.c. max. (£30)	15—20	...
59,400	,,	7½	7½	Do. 7½ p.c. max. (£30) ...	10—15	...
51,160	June 10	5½	5½	Do. 5½ p.c. Deb.	100—105	...
152,600	Feb. 26	8	9	Guildford Cons.	110—120	...
54,055	,,	5	5	Do. 5 p.c. Pref.	90—95	...
68,250	June 17	5	5	Do. 5 p.c. Deb.	95—100	...
156,690	Feb. 19	7	5	Hampton Court Cons. ...	75—85	...
86,046	June 17	5	5	Holyh'd&N.W.G.&W.Cpn.Ord.	13/—15/-	...
80,000	Feb. 12	4	4	Lea Bridge 4 p.c. Pref.	75—80	...
60,000	,,	6	6	Do. 6 p.c. Pref.	105—115	...
94,876	June 17	4	4	Do. 4 p.c. Deb.	85—90	...
73,620	Mch. 18	8½	8½	Luton Cons. 'A'	115—125	...
107,960	Feb. 26	4	5½	Mid Kent Ord. (£10)	7½—8½	...
230,940	Feb. 5	10	10	Oxford & District Ord. ...	135—145	...
47,112	,,	5	5	Do. 5 p.c. Pref.	85—90	...
50,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
126,193	May 13	7½	7½	Peterborough Ord.	138—148	...
64,990	Mch. 18	7	7	Redditch Ord.	100—110	...
166,850	Feb. 19	8	8	Romford Ord.	108—118	...
60,000	,,	4	4	Do. 4 p.c. Pref.	85—90	...
44,000	Mch. 18	5	5	Do. 5 p.c. Deb.	95—100	-2
25,570	Feb. 12	5¼	5½	Rugby 5½ p.c. Pref.	100—110	...
25,000	,,	6	6	Do. 6 p.c. Red. Pref. ...	100—105	...
42,750	Dec. 11	5½	5½	Do. 5½ p.c. Deb.	102—107	...
110,950	Feb. 26	8	8	Ryde Ord.	100—110	...
270,086	Mch. 18	7	7	Slough Ord.	98—103	...
21,000	June 10	5	5	Do. 5 p.c. Deb.	95—100	-2
28,872	May 13	5½	5½	S. Midland Gas Cpn. Ltd. Ord.	14/—16/-	...
28,866	Mch. 18	4½	4½	Do. 4½ p.c. Red. Cum. Pref.	14/—16/-	...
127,228	Feb. 19	5	7	Swindon Cons.	75—80	...
60,425	June 24	5	5	Do. 5 p.c. Deb.	93—98*	-2
64,380	June 17	5	5	Torquay & Paignton 5 p.c. Pref.	83—88	...
130,000	Feb. 12	5	5	Wakefield Ord.	85—95	...
81,650	,,	5	5	Do. 5 p.c. max.	75—80	...
82,000	Jan. 29	6	6	Weymouth Ord.	82—87	...
273,626	Feb. 12	7	7	Wolverhampton Cons. Ord. ...	115—120	...
98,384	,,	6	6	Do. 6 p.c. Pref.	105—115	...
160,000	June 17	5½	5½	Do. 5½ p.c. Red. Deb. ...	98—103	...
106,490	Mch. 18	5½	5½	Wrexham Ord	75—85	...
90,000	June 24	5	5	York 5 p.c. Red. Deb.	94—99*	-1
133,640	Feb. 19	6	6	Yorktown (Cam.) 5 p.c. Cons.	82—87	...
120,000	,,	5	5	Do. 5 p.c. Pref.	85—90	...
35,000	June 17	5½	5½	Do. 5½ p.c. Deb.	103—108	...

BRISTOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
347,756	Feb. 1	5	6	Bath Cons.	100—105	...
1,667,250	Feb.	5	5	Bristol, 5 p.c. max.	88—92	-2½
120,420	June 17	4	4	Do. 1st 4 p.c. Deb. ...	95—98	...
415,250	,,	4	4	Do. 2nd 4 p.c. Deb. ...	95—98	...
328,790	,,	5	5	Do. 5 p.c. Deb.	109—112	...
274,000	Feb. 26	5	5	Newport (Mon.) Ord.	91—94	...
13,200	Mch. 26	7	8½	Pontyp'l Gas & W. 10 p.c. 'A'	11½—12½	...
13,600	,,	5	6	Do. 7 p.c. 'B'	9½—10½	...
40,000	,,	5	6	Do. 7 p.c. 'C'	9½—10½	...
140,778	Feb. 12	5	5	Weston-super-Mare Cons. ...	88—92	...
64,338	Dec. 27	4	4	Do. 4 p.c. Deb.	90—95	...
33,340	,,	7½	7½	Do. 7½ p.c. Deb.	140—150	...

LIVERPOOL EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
157,150	Feb. 5	5	6½	Chester 5 p.c. Ord.	98—101	...
92,500	June 17	4	4	Do. 4 p.c. Pref.	83—87	...
36,430	,,	3½	3½	Do. 3½ p.c. Deb.	84—87	...
41,890	,,	4	4	Do. 4 p.c. Red. Deb. ...	94—98	...
2,167,410	Feb. 19	6	6	Liverpool 5 p.c. Ord.	100—102	...
245,500	June 17	5	5	Do. 5 p.c. Red Pref. ...	99½—102½	...
306,083	July 17	4	4	Do. 4 p.c. Deb.	98—101	...
106,280	Feb. 5	10	8	Preston 'A' 10 p.c.	160—170	...
188,219	,,	7	7	Do. 'B' 7 p.c.	115—125	...

NEWCASTLE EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
122,577	Feb. 19	7	7	Blyth 5 p.c. Ord.	113—118	...
732,000	Feb. 19	4	4	Hartlepool G. & W. Co. & New	65—68	+3½
2,430,267	Feb. 5	5	5 7/16	Newcastle & Gateshead Con.	17/—18/a	...
682,856	,,	4	4	Do. 4 p.c. Pref.	85—86	...
776,706	Dec. 27	3½	3½	Do. 3½ p.c. Deb.	80—85	-2
277,285	April 24	5	5	Do. 5 p.c. Deb. '43 ...	97—102	...
332,351	Feb. 5	6	6	Sunderland 6 p.c. max. ...	111—113	...

NOTTINGHAM EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
542,270	Feb. 12	6	9	Derby Con.	103—108	...
55,000	June 10	4	4	Do. 4 p.c. Deb.	96—102	...
20,000	June 24	5	5	Long Eaton 5 p.c. Pref. ...	9—11*	...
80,000	June 24	5	5	Do. 5 p.c. Deb. ...	100—105*	...

SHEFFIELD EXCHANGE

Issue. £	When ex-Dividend.	Dividends. Prev. Hf. Yr. % p.a.	Dividends. Last Hf. Yr. % p.a.	NAME.	Quotations June 28.	Rise or Fall on Week.
10,000	Feb. 19	10	10	Great Grimsby 'A' Ord. ...	170—180	...
6,500	,,	10	10	Do. 'B' Ord. ...	170—180	...
79,000	,,	10	10	Do. 'C' Ord. ...	160—170	...
1,806,339	Feb. 26	6½	6½	Sheffield Cons.	123—126	...
95,000	Jan. 2	4	4	Do. 4 p.c. Deb.	98—100	...

a The quotation is per £1 of Stock.
* Ex. div. ‡ For year.

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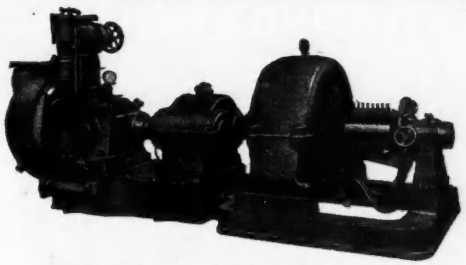

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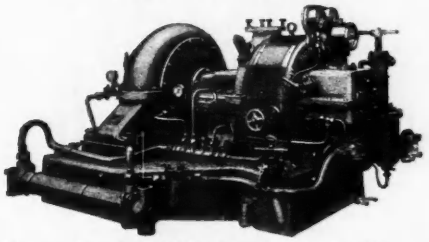

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